Acuvim II Series Power Meter

User's Manual

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The information contained in this document is believed to be accurate at the time of publication, however, Accuenergy assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice. Please ask the local representative for latest product specifications before ordering.

Please read this manual carefully before doing installation, operation and maintenance of Acuvim II meter.

Following symbols are used in this user's manual and on Acuvim II meter to alert the dangerous or to prompt in the operating or set process.

Dangerous symbol, Failure to observe the information may result in injury or death.

Alert symbol, Alert the potential dangerous. Observe the information after the symbol to avoid possible injury or death.

This mark is on product for UL Listed product

Installation and maintenance of the Acuvim II meter should only be performed by qualified, competent personnel that have appropriate training and experience with high voltage and current device.

This document is not fit for people without adequate experience and training. Accuenergy is not liable for any problems occurring under proper operation.

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Starting!

Congratulations!

You have received an advanced, versatile, multifunction power meter, also known as a Remote terminal unit (RTU), which will greatly benefit your power system.

When you open the package, you will find the following items

1.	Acuvim II meter	1
2.	Pluggable Terminal	3
3.	Installation clips	4
4.	User's operation manual	1
5.	Maintenance guarantee card	1

Please read this manual carefully before operating or setting the Acuvim II meter to avoid unnecessary trouble. You can read part of this manual depends on how you use the Acuvim II meter.

Chapter 1 helps you to understand the fundamental function, specification and application area of Acuvim II.

Chapter 2 describes detailed installation and wiring of Acuvim II.

Chapter 3 describes the data display and parameter setting method.

Chapter 4 outlines the functions of Acuvim II and the way to use them.

Chapter 5 gives the address table of Acuvim II.

Appendix lists the technical data and specifications and ordering information.

Chapter 1 Introduction

The Purpose of Acuvim II

The Application Area of Acuvim II

The Functions of Acuvim II

1.1 The Purpose of Acuvim II

Powerful Multifunction Power Meter

Acuvim II Multifunction digital power meter is designed using modern MCU and DSP technology. It integrates three-phase energy measuring and displaying, energy accumulating, power quality analysis, malfunction alarming and network communication. Large and vivid LCD meets your visual requirement greatly. Graceful and high-lighted back light makes it easy to check the measuring data. Simple HMI interface makes it easy to master. Multi-row displaying lets you observe various data without touching any keys.

Ideal Choice for Electric Automation SCADA System

Acuvim II can be used to replace all traditional electric meters. It also can be used as Remote Terminal Unit (RTU) for monitoring and controlling in a SCADA system. All the measured data is available via digital RS485 communication ports running the Modbus™ protocol.

Energy Management

Acuvim II can measure bidirectional four quadrants kWh and kvarh. It can provide maximum/minimum energy data and energy demand data. With the help of master software, you can easily know how the load and energy are running. It automatically gives you all kinds of measurement tables as well.

Remote Power Control

The main function of Acuvim II is measuring, and it also has some flexible I/O functions, which make the meter very useable as a distributed RTU (metering, monitoring, remote controlling in one unit).

Power Quality Analysis

With the help of powerful digital signal processing technology, the Acuvim II intelligent power meter can be used as an online power quality analysis instrument. It can simultaneously and continuously give out the analysis results such as THD of voltage and current, harmonics up to 31st order and unbalance factor of voltage and current, etc.

1.2 The Application Area of Acuvim II

Power Distribution Automation
Intelligent Electric Switch Gear
Industry Automation
Building Automation
Energy Management System
Substation Automation
Resident district power monitoring

1.3 The Function of Acuvim II

Multifunction, High Accuracy

Acuvim II Multifunction Intelligent power meter is powerful in data collecting and processing. It can not only measure up to several decades of power parameters, but also do demand metering, harmonic analysis, statistics of max/min, over range alarming, energy accumulating etc.

Accuracy of Voltage and Current is 0.2%, True-RMS.
Accuracy of Power and Energy is 0.5%, four quadrants metering.

Small Size and Easy Installation

Acuvim II can be installed using a standard ANSI C39.1 (4" Round) or an IEC 92mm DIN (Square) form. With the 51mm depth after mounting, the Acuvim II can be installed in a small cabin. The fixing clips are used for easy installation and remove.

Easy to Use

With a large high density LCD screen, the display of the Acuvim II is easy to read and use. All the measuring data and setting parameters can be accessed by using panel keys or a communication port. The setting parameters are protected in EEPROM, which will maintain its content after the meter is powered off. With the backlight of the LCD, the display can be easily read in a dim environment. The back light "on" time is selectable.

Multiple Wiring Modes

The Acuvim II can easily be used in high voltage, low voltage, three phase three wires, three phase four wires and single phase system using approximate wiring.

High safety, high stability

Acuvim II was designed according to industrial standards. It can run stably under high power disturbance condition as it has passed EMC and Safety test according to IEC standards and UL certification.

Chapter 2 Installation

Appearance and Dimensions

Installation Method

Wiring of Acuvim II

Considerations When Installing Meters

- Installation of the Meter must be performed by only qualified personnel who follow standard safety precautions during all procedures. Those personnel should have appropriate training and experience with high voltage devices. Appropriate safety gloves, safety glasses and protective clothing are recommended.
- During normal operation of the Meter, dangerous voltages flow through many parts of the meter, including: Terminals and any connected CTs (Current Transformers) and PTs (Potential Transformers), all I/O Modules (Inputs and Outputs) and their circuits. All Primary and Secondary circuits can, at times, produce lethal voltages and currents. Avoid contact with any current-carrying surfaces.
- Do not use the meter or any I/O Output Device for primary protection or in an energy-limiting capacity. The meter can only be used as secondary protection. Do not use the meter for applications where failure of the meter may cause harm or death. Do not use the meter for any application where there may be a risk of fire.
- All meter terminals should be inaccessible after installation.
- Do not apply more than the maximum voltage the meter or any attached device can withstand. Refer to meter and/or device labels and to the Specifications for all devices before applying voltages. Do not HIPOT/ Dielectric test any Outputs, Inputs or Communications terminals.
- ACCUENERGY recommends the use of Shorting Blocks and Fuses for voltage leads and power supply to prevent hazardous voltage conditions or damage to CTs, if the meter needs to be removed from service. CT grounding is optional.
- ACCUENERGY recommends use dry cloth to wipe the meter.

NOTE: IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.

NOTE: THERE IS NO REQUIRED PREVENTIVE MAINTENANCE OR INSPECTION NECESSARY FOR SAFETY. HOWEVER, ANY REPAIR OR MAINTENANCE SHOULD BE PERFORMED BY THE FACTORY.

DISCONNECT DEVICE: The following part is considered the equipment disconnect device.

A SWITCH OR CIRCUIT-BREAKER SHALL BE INCLUDED IN THE END-USE EQUIPMENT OR BUILDING INSTALLATION. THE SWITCH SHALL BE IN CLOSE PROXIMITY TO THE EQUIPMENT AND WITHIN EASY REACH OF THE OPERATOR. THE SWITCH SHALL BE MARKED AS THE DISCONNECTING DEVICE FOR THE EQUIPMENT.

The installation method is introduced in this chapter. Please read this chapter carefully before beginning installation work.

2.1 Appearance and Dimensions

Appearance

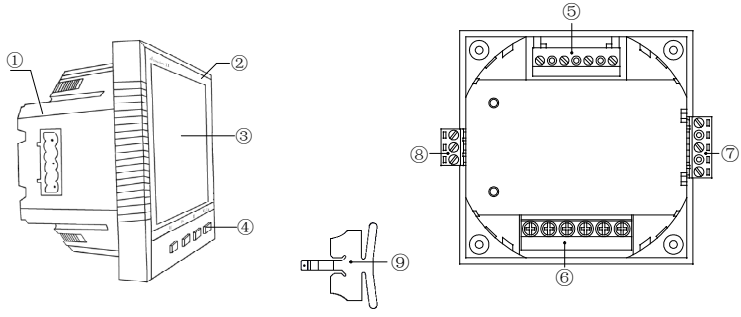


Fig 2.1 Appearance of Acuvim II

Part Name	Description
1. Enclosure	The Acuvim II enclosures are made of high strength anti-combustible engineering plastic
2. Front Casing	After the installation, this part is before the panel.
3. LCD Display	Large bright white backlight LCD Display
4. Key	Four keys are used to select display and set
5. Voltage Input Terminals	Used for Voltage input
6. Current input Terminals	Used for Current input
7. Power Supply Terminals	Used for Supply input
8. Communication Terminals	Communication output
9. Installation Clip	The clips are used for fixing the meter to the panel

Table 2.1 Part name of Acuvim II

Dimensions (mm)

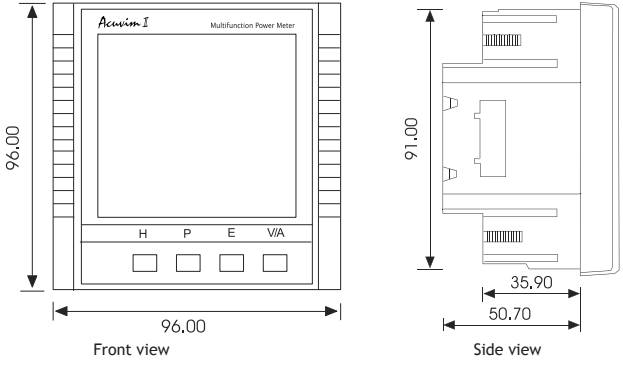


Fig 2.2 Dimensions

2.2 Installation Method

Environmental

Before installation, please check the environment temperature and humidity to ensure the Acuvim II meter is being placed where optimum performance will occur.

Temperature

Operation: -25℃ to 70℃.

Storage: -40℃ to 85℃

Humidity

5% to 95% non-condensing.

Acuvim II meter should be installed in dry and dust free environment and avoid heat, radiation and high electrical noise source.

Installation Steps

Acuvim II can be installed using a standard ANSI C39.1 (4" Round) or an IEC 92mm DIN (Square) form.

1. Firstly, cut a square hole or round hole on the panel of the switch gear.

The cutting size is shown in fig 2.3. The Unit is mm.

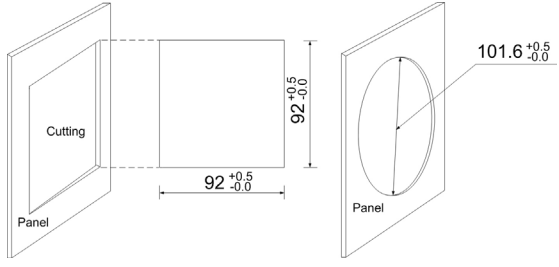


Fig 2.3 Panel Cutting

2. Secondly, remove the clips from the meter, and insert the meter into the square hole from the front side.

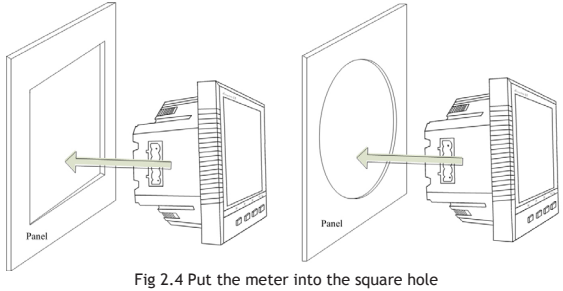


Fig 2.4 Put the meter into the square hole

3. Finally, put clips back to the meter from the backside and push the clip tightly so that the meter is fixed on the panel.

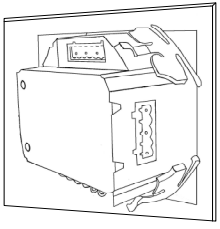


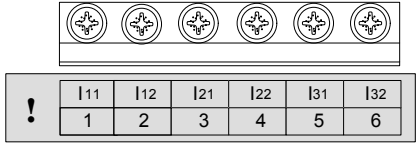
Fig 2.5 Use the clips to fix the meter on the panel

2.3 Wiring of Acuvim II

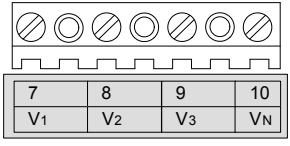
Terminal Strips

There are four terminal strips on the back of Acuvim II. The 1, 2 and 3 are used to represent each phase of three phase system. They have the same meaning with A, B and C or R, S and T in three phase system.

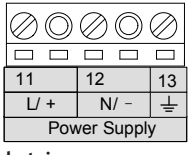
Current Input Terminal Strip



Voltage Input Terminal Strip



Power Supply Terminal strip



Communication terminal strip

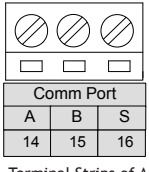


Fig 2-6. Terminal Strips of Acuvim II

DANEROUS

Only the qualified personnel could do the wire connection work. Make sure the power supply is cut off and all the wires are powerless. Failure to observe it may result in severe injury or death.

Safety Earth Connection

Before doing the meter wiring connection, please make sure that the switch gear has a safety Earth system. Connect the meter safety earth terminal to the switch gear safety earth system. The following safety earth symbol is used in this user' s manual.

Fig 2-7 Safeth Earth Symbol

NOTE

Make sure the auxiliary power terminal of the meter ground is connected to the safety Earth of switchgear.

Auxiliary Power

The auxiliary power supply of the Acuvim II meter is 100-415Vac (50/60Hz) or 100-300Vdc. The meter's typical power consumption is very little so it can be supplied by an independent source or by the line to be measured. A regulator or a UPS should be used when the power supply undulates too much. The terminals for the auxiliary power supply are 11, 12 and 13 (L, N, and Ground). A switch or circuit-breaker shall be included in the building installation, and it shall be in close proximity to the equipment and within easy reach of the operator, and it shall be marked as the disconnecting device for the equipment.

NOTE

Make sure the voltage of power supply is the same as what the meter needed for its auxiliary power.

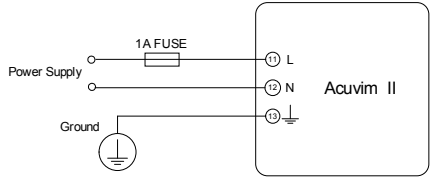


Fig 2-8 Power supply

A fuse (typical 1A/250Vac) should be used in auxiliary power supply loop. No. 13 terminal must be connected to the safety earth system of switchgear. An isolated transformer or EMC filter should be used in the auxiliary power supply loop if there is power quality problem in the power supply.

NOTE

A filter should be used if there is EMI problem.

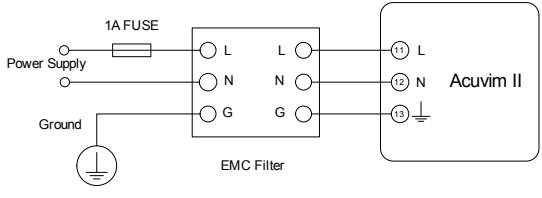


Fig 2-9 Power supply under noisy condition

Choice of wire of power supply could be AWG22-16 or 0.6-1.5mm^2.

Voltage Input

Input voltage of Acuvim II should be 400 LN/690 LL VAC rms(three phases), 400 LN VAC(single phase).

In high voltage system, a PT must be used. The secondary output of the PT should be 100V or 120V typically. The accuracy of measurement is related to the PT you select, so be careful! For the star system, the

primary rated voltage of PT is equal to or close to the phase voltage of the system. For the delta system, it is the line voltage of the system. A fuse (typical 1A/250Vac) should be used in voltage input loop. The wire of voltage input could be AWG16-12 or 1.3-2.0mm^2.

Note: In no circumstance could the secondary of PT be shorted. The secondary of PT should be well grounded at one end.

Current Input

In a practical engineering application, CTs should be installed in the loop of measuring. Normally the secondary of CT is 5A. 1A is possible in the ordering option. A CT of accuracy over 0.5% (rating over 3VA) is recommended and it will influence the measuring accuracy. The wire between CT and Acuvim II should be as short as possible. The length of the wire may increase the error of the measurement. CTs must be required if the rated current is over 5A.

The wire number of current input could be AWG15-10 or 1.5-2.5mm^2.

The CT loop should not be open circuit in any circumstance when the power is on. There should not be any fuse or switch in the CT loop and one end of the CT loop should be well connected to the ground.

Vn Connection

Vn is the reference point of Acuvim II voltage input. The lower is the wire resistance the better is the accuracy. The wiring mode of Vn depends greatly on the system wiring mode. Please refer to the wiring diagram.

Three phase wiring diagram

Acuvim II can satisfy almost all kinds of three phase wiring diagram.

Please read this part carefully before you begin to do the wiring so that you can choose a suitable wiring method for your power system.

The voltage and current input wiring mode can be set separately in the meter parameter setting process. The voltage wiring mode could be 3-phase 4-line Wye (3LN), 3-phase 4-line 2PT Wye mode (2LN) and 3-phase 3-line open delta (2LL). The current input wiring mode could be 3CT, 2CT and 1CT. Any voltage mode could be group with one of the current mode.

Voltage Input Wiring

3-Phase 4-Line Wye mode (3LN)

The 3-Phase 4-Line Wye mode is popularly used in low voltage electric distribution power system. The power line can be connected to the meter voltage input directly as in fig 2.10a. In the high voltage input system, 3PT Wye mode is often used as in fig 2.10b. The voltage input mode of the Acuvim II should be set 3LN for both voltage input wiring mode.

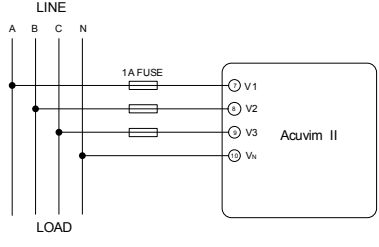


Fig 2.10a 3LN direct connection

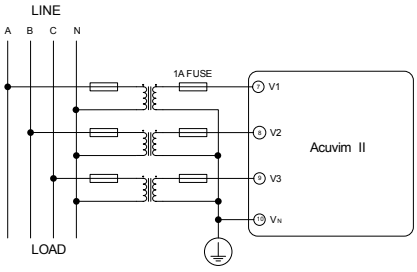


Fig 2.10b 3LN with 3PT

3-Phase 4-Line 2PT mode (2LN)

In some 3-Phase 4-Line Wye system, 2PT Wye mode is often used as in fig2.11, where the 3 phases of power system is supposed to be balanced. The voltage of V2 is calculated according to the V1 and V3. The voltage input mode of the Acuvim II should be set 2LN for 2PT voltage input wiring mode.

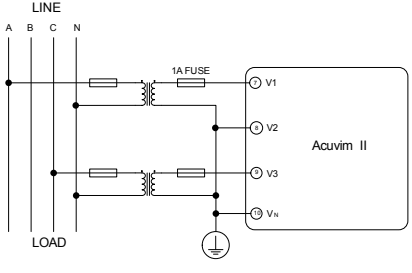


Fig 2.11 2LN with 2PTs

3-Phase 3-Line direct connection mode (3LL)

In a 3-Phase 3-Line system, power line A, B and C are connected to V1, V2 and V3 directly. Vn is floated. The voltage input mode of the Acuvim II should be set 3LL.

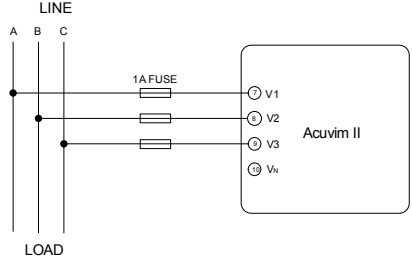


Fig 2.12 3LN 3-Phase 3-Line direct connection

3-Phase 3-Line open Delta Mode (2LL)

Open delta wiring mode is often used in high voltage system. V2 and Vn are connected together in this mode. The voltage input mode of the Acuvim II should be set 2LL for voltage input wiring mode.

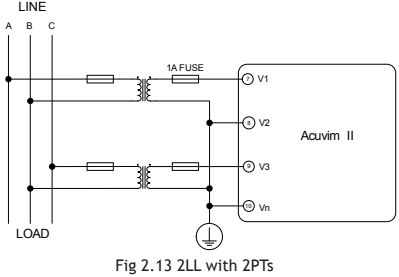


Fig 2.13 2LL with 2PTs

Current Input Wiring

3CT

All the current input of three phase system can be looked as 3CT one, whether there are 2 CTs or 3 CTs in the input side. The current input mode of the Acuvim II should be set 3CT for this current input wiring mode.

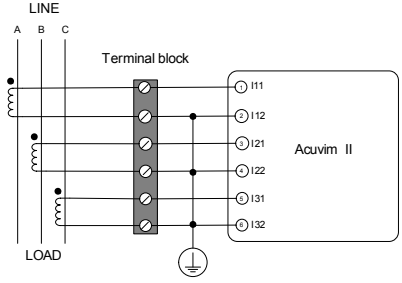


Fig 2.14 3CTs a

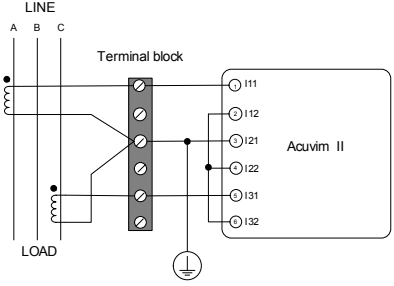


Fig 2.15 3CTs b

2CT

The difference of the fig 2.16 and the fig.2.15 is that there is no current input in the I21 and I22 terminals. The I2 value is calculated from formula i1+i2+i3=0. The current input mode of the Acuvim II should be set 2CT for this current input wiring mode.

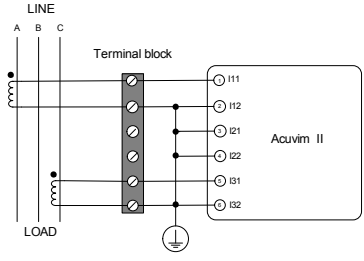


Fig 2.16 2CTs

1CT

If it is a three phase balance system, 1 CT connection method can be used. All the other two current are calculated according to the balance supposing.

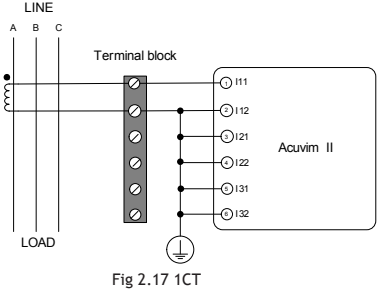


Fig 2.17 1CT

Frequently used wiring method

The voltage and current wiring method are put together in one drawing. The Acuvim II meter will display normally only that the setting of the meter is assorted with the wiring of the voltage and current input.

1. 3LN, 3CT with 3 CTs

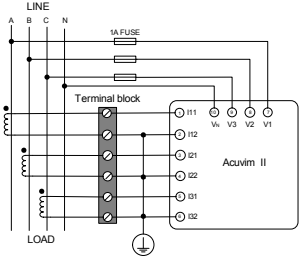


Fig 2.18 3LN, 3CT

2. 3LN, 3CT with 2 CTs

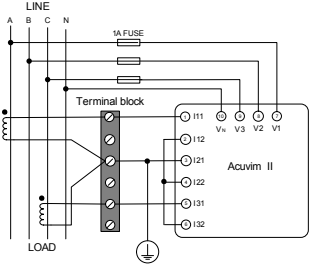


Fig 2.19 3LN, 3CT with 2CTs

3. 2LN, 2CT

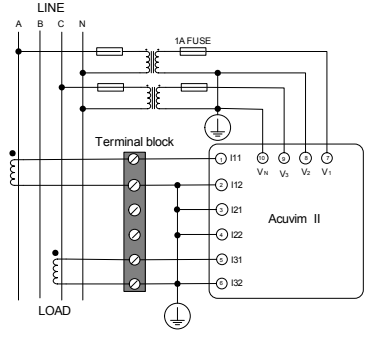


Fig 2.20 2LN, 2CT

4. 2LN, 1CT

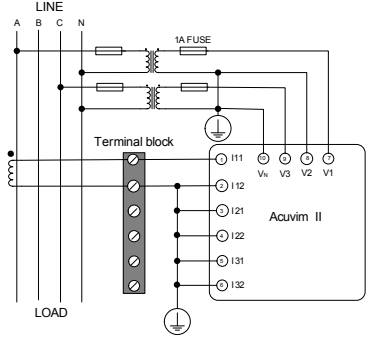


Fig 2.21 2LN, 1CT

5. 2LL, 3CT

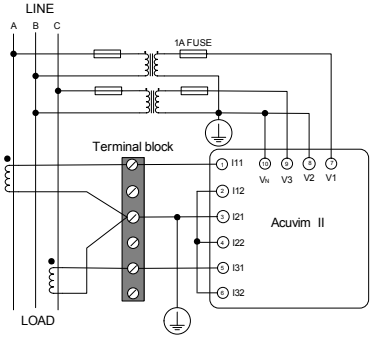


Fig 2.22 2LL, 3CT

6. 2LL, 2CT

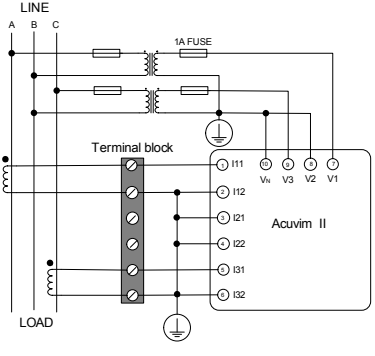


Fig 2.23 2LL, 2CT

7. 2LL, 1CT

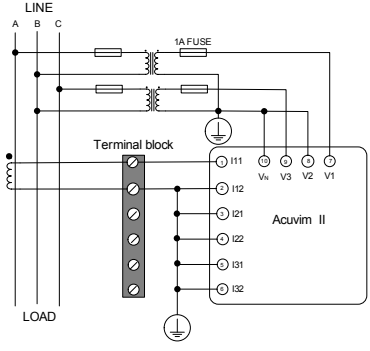


Fig 2.24 2LL, 1CT

8. Single Phase 2 Line (Wiring mode setting 3LN, 3CT)

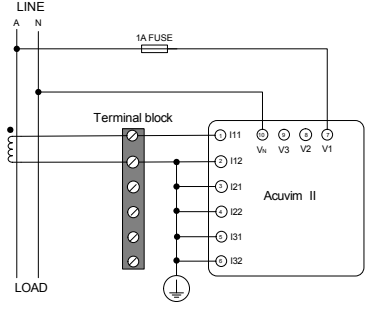


Fig 2.25 Single phase 2Lines

9. Single Phase 3 Line (Wiring mode setting 3LN, 3CT)

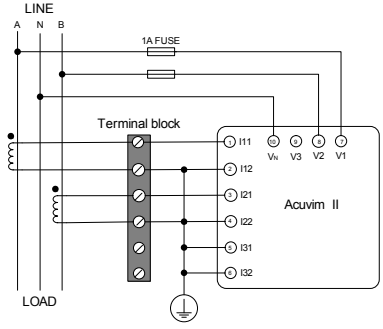


Fig 2.26 Single phase 3Lines

Communication

The communication port and protocol of Acuvim II are RS485 and Modbus-RTU. The terminals of communication are A, B, and S (14, 15, 16). A is differential signal +, B is differential signal - and S is connected to shield of twisted pair cable. Please use good quality shielded twisted pair cable, AWG22 (0.5mm^2) or higher. The overall length of the RS485 cable connecting all devices should not exceed 1200m (4000ft). Acuvim II is used as a slave device of masters like PC, PLC, data collector or RTU.

If the master does not have RS485 communication port, a converter has to be used. Normally a RS232/RS485 or USB/RS485 is adopted. The topology of RS485 net can be line, circle and star.

For the high quality communication, good quality shielded twisted pair of cable AWG22 (0.5mm^2) or higher is very important.

The shield of each segment of the RS485 cable must be connected to the ground at one end only.

Every A(+) should be connected to A(+), B(-) to B(-), or it will influence the network, or even damage the communication interface.

The connection topology should avoid “T” type which means there is a new branch and it does not begin from the beginning point.

Keep communication cables away as much as possible from sources of electrical noise.

When many devices are connected to the same long communication line, an antireflection resistor of 120Ω-300Ω is preferred which will be connected to A and B at the end of the line.

Use RS232/RS485 or USB/RS485 converter with optical isolated output and surge protection.

Chapter 3 Meter Operation and Parameter Setting

Display Panel and Keys

Metering Data

Statistics Data

Demand Data

Harmonic Data

Expanded I/O Module Data

Parameters Setting

Detailed human-machine interface of the meter will be described in this chapter, including how to get the metering data and how to do the parameter setting.

3.1 Display Panel and Keys

There are one display panel and four keys in the front of Acuvim II. All the display segments are illustrated in fig 3.1. Users should note that all the segments will not display in a single page when normally used.

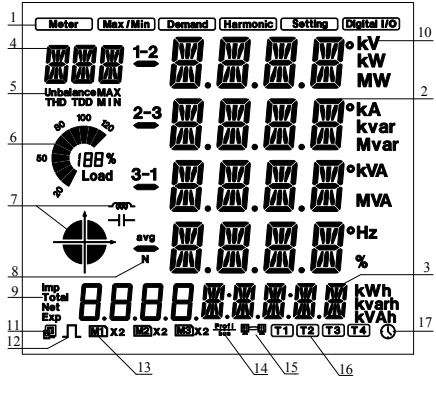


Fig3.1 All Display Segments

SN	Display	Description
1	Display mode indication	It shows the topic of the display area, “Meter” for real-time measurement; “Max/Min” for statistic data; “Demand” for power demand data; “Harmonic” for harmonic data; “Setting” for parameters setting; “Digital I/O” for expended IO module data.

2	Four lines of " " letters in the metering area	Main Display Area: display metering data such as voltage, current, power, power factor, frequency, imbalance, phase angle, etc; display statistics such as maximum and minimum; display demand data; display settings and display expanded I/O data.
3	four " " and five " " letters	Display energy data and real-time clock. Also used for the setting mode and digital I/O mode display.
4	three " " letters	Item label: "U" for voltage; "I" for current; "P" for active power; "Q" for reactive power; "S" for apparent power; "PF" for power factor; "F" for frequency; "∠" for phase angles; "DMD" for demand; display setting page number; display expanded IO module type for "Mxx".
5	Unbalance、THD、TDD、MAX、MIN	Item Label: "Unbalance" for imbalance of the voltage and current; "THD" for total harmonics distortion; "TDD" for total demand distortion; "MAX" for maximum and "MIN" for minimum
6	Load rate	Display the percentage of the load current to the nominal current.
7	Four quadrant label and load type label	: the quadrant of the system power Inductor label: inductive load Capacitor label: capacitive load
8	1-2, 2-3, 3-1, avg, N	1, 2, 3 for 3 phase A, B, C; 1-2, 2-3, 3-1 for 3 phase line-to-line AB, BC, CA; avg for average and N for neutral.
9	Energy label: Imp, Total, Net, Exp	Imp: consumption energy; Exp: generation energy; Total: absolute sum of Imp and Exp energy Net: algebraic sum of Imp and Exp energy

10	Unit	voltage: V, kV; current: A, kA; active power: kW, MW; reactive power: kvar, Mvar; apparent power: kVA, MVA; frequency: Hz; active energy: kWh; reactive energy: kVarh; apparent energy: kVAh; percentage: %; phase angle: °
11	Communication label	No label: no communication One label: inquiry Two labels: inquiry and answer
12	Energy pulse output indicator	No label: no pulse output With label: pulse output
13	Expanded I/O module indicator M1 X2 M2 X2 M3 X2	M1: one AXM-IO1 connected M1x2: two AXM-IO1 connected None: no AXM-IO1 connected M2: one AXM-IO2 connected M2x2: two AXM-IO2 connected None: no AXM-IO2 connected M3: one AXM-IO3 connected M3x2: two AXM-IO3 connected None: no AXM-IO3 connected
14	Profibus module indicator Profibus	None: Profibus module not connected illume: Profibus module connected
15	Ethernet module indicator	None: Ethernet module not connected illume: Ethernet module connected
16	T1 T2 T3 T4	reserved
17	time label	Time display in energy area

There are four keys in the front panel, label as H, P, E and V/A from left to right. Use these four keys to read metering data and set the parameters.

Note: If the backlight is off before you press any keys, it will become on and no other functions will be activated.

3.2 Metering Data

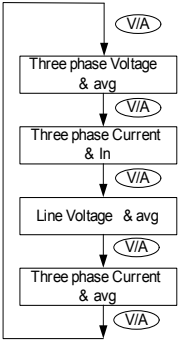
Press H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left to "Meter", then press V/A, and you will enter the metering mode.

In the metering mode, meter displays measurements such as voltage, current, power, power factor, phase angle, imbalance, etc.

a) Voltage and Current:

Press V/A to read voltage and current in the metering area. The screen will roll to the next page as you press V/A each time. It will go back to the first screen if you press V/A at the last screen.

The following figure shows how it rolls:



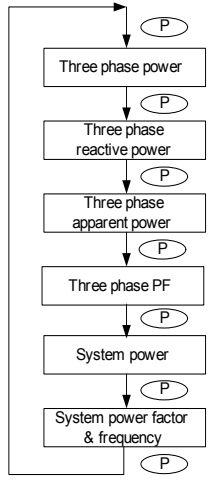
Note: When the meter is set to "2LL" or "3LL", there is no phase voltage and neutral current display. So only the third and fourth screens will be displayed.

b) Power, Power Factor and Frequency:

Press P, display power related data.

The screen will roll to the next page as you press P each time. It will go back to the first screen if you press P at the last screen.

The following figure shows how it rolls:



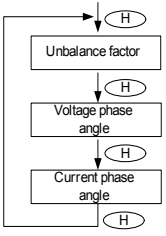
Note: When the meter is set to "2LL" or "3LL", only the fifth and sixth screens will be displayed.

c) Phase Angles and Imbalance:

Press H, display phase angles and imbalance data. The screen will roll to the next page as you press H each time. It will go back to the first screen

if you press H at the last screen.

The following figure shows how it rolls:



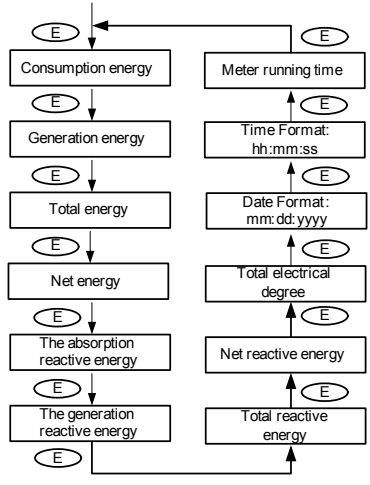
Note: Voltage stands for line-to-line voltage when the wiring setting is "2LL" or "3LL" and for line-to-neutral voltage when other wiring settings.

d) Energy:

Press E key, display energy and real time clock. The screen will roll to the next page as you press E each time. It will go back to the first screen if you press E at the last screen.

Acuvim II meter can be set to record primary power or secondary power. The unit of power is kWh for active power, kvarh for reactive power and kVAh for apparent power. The running time begins to take record at the time when the meter is turned on, with the accuracy of 0.01H and is stored in the non-volatile memory. It can be reset via communication and panel.

The following figure shows how it rolls:



3.3 Statistics Data

Press H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left to "Max/Min", then press V/A, and you will enter the statistics data mode.

In the statistics data mode, meter displays the maximum values and minimum values for voltage, current, power, power factor, imbalance, demand, THD, etc. User should note that there are no time label displays and they can only be accessed through communication.

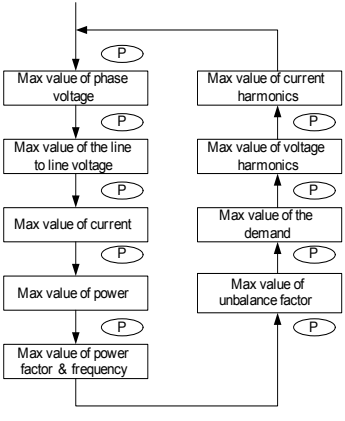
Press H, no functions.

Press P, screen will roll to the next page, and will roll back to the first screen when pressed at the last page.

Press E, screen will roll back to the last page, and will roll back to the last screen when pressed at the first page.

V/A is used for switch the display between maximum and minimum. For example, if the maximum of the phase voltage is displayed, press V/A, and the display will switch to minimum of the phase voltage. If you press again, it will switch back to the display of the maximum. Each time you press V/A, it switches.

The following figure shows how it rolls:



Note:

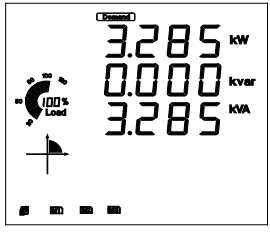
i) The figure shows the rolling sequence for using key P. If using E key for rolling page, the sequence will reverse.

ii) When meter is set to “2LL” or “3LL”, the first screen will not be displayed.

3.4 Demand Data

Press H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left to “Demand”, then press V/A, and you will enter the demand data mode.

In the demand data mode, there is only one page, displaying the demand of active power, reactive power and apparent power.



As shown in the figure, system active power demand is 3.285kW, system reactive power demand is 0 kvar, system apparent power demand is 3.285 kVA.

3.5 Harmonic Data

Press H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left to “Harmonic”, then press V/A, and you will enter the harmonic data mode.

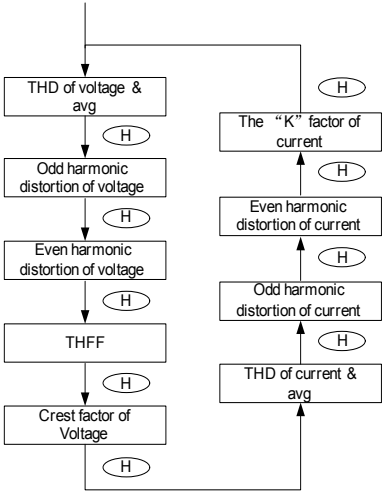
In the harmonic data mode, meter displays the harmonic ratio of voltage and current, THD, odd HD, even HD, THFF, CF and KF.

a) Power Quality Data:

Press H, display power quality data. It rolls to the next page when press H each time and roll back to the first page when press H at the last page.

Press P, no function.
Press E, no function.

Press V/A, switch to the display of harmonic ratio data.



b) Harmonic Ratio Data

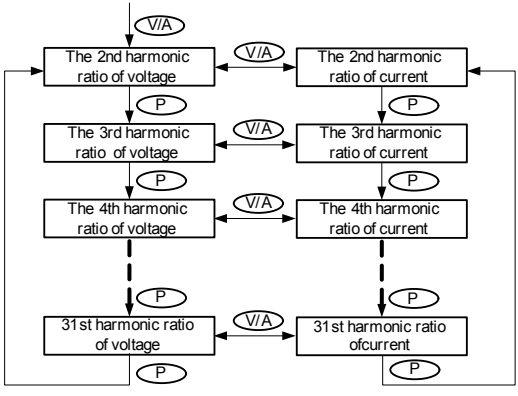
Press H, switch to the display of power quality data.

The harmonic order will add by one when press P each time and will back to 2nd when press P at the 31st harmonics.

The harmonic order will minus by one when press E each time and will back to 31 when press E at the 2nd harmonics.

Press V/A, switch display between voltage harmonics and current harmonics.

The following figure shows how it rolls:



Note: The figure shows the rolling sequence for using key P. If using E key for rolling page, the sequence will reverse.

3.6 Expanded I/O Module Data

Press H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left to "Digital I/O", then press V/A, and you will enter the expanded I/O module data mode.

In the expanded I/O module data mode, meter displays the data from expanded I/O modules, such as DI status, pulse counter number, Relay status, Analog Output, and Analog Input, etc.

In the expanded I/O module data mode, first page is the module selection and you can choose any module as you wish. If no expanded I/O module is connected, it will display “NO IO”.

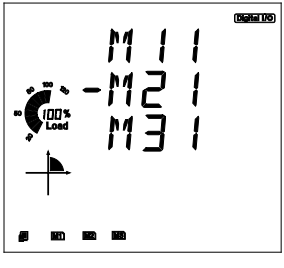
a) Module Selection:

Press H, no function.

Press P, move the cursor downwards. When the cursor is at the bottom, press P will move the cursor to the top. If there is only one module connected, press P will have no effect.

Press E, move the cursor upwards. When the cursor is at the top, press E will move the cursor to the bottom. If there is only one module connected, press E will have no effect.

Press V/A, select the module and enter the I/O module data selection mode.



As shown in the figure, three modules are connected, AXM-IO11, AXM-IO21, AXM-IO31, which are indicated by M11, M21, M31 respectively. The cursor points to M21, which indicates that AXM-IO21 is chosen now.

b) I/O Module Data Selection

Press H, back to module selection mode.

Press P, move the cursor downwards. When the cursor is at the bottom, press P will move the cursor to the top. Please note that there are 3 parameters for AXM-IO1, 3 parameters for AXM-IO2 and 4 parameters for AXM-IO3.

Press E, move the cursor upwards. When the cursor is at the top, press E will move the cursor to the bottom.

Press V/A, select the parameter and enter the display of the data.

c) I/O module data display

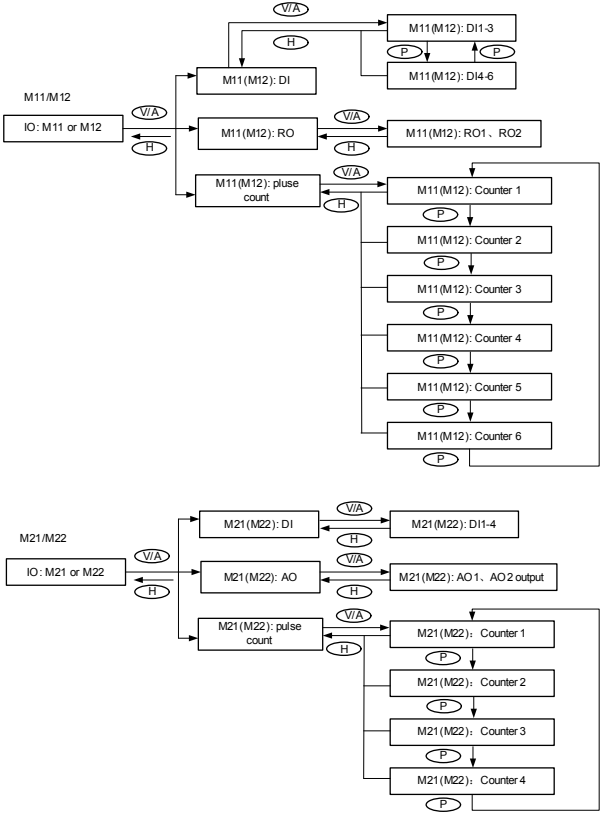
Press H, back to I/O module data selection mode.

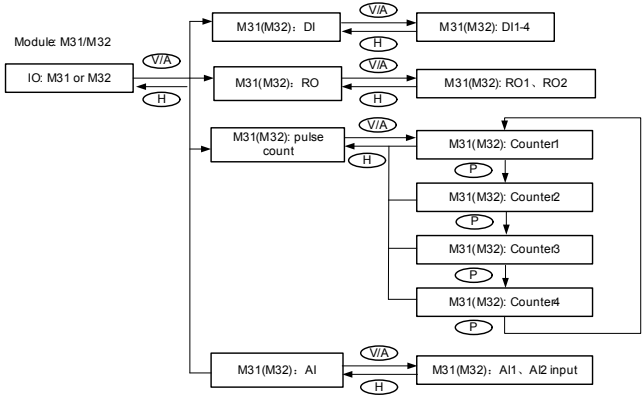
The screen will roll to the next page each time when press P and will roll back to the first page when press P at the last page. If only one page exist, press P will have no effect.

The screen will roll to the last page each time when press E and will roll back to the last page when press E at the first page. If only one page exist, press E will have no effect.

Press V/A, no function.

The following figure shows how it rolls:


M11/M12
IO: M11 or M12
V/A
H
M11(M12): DI
M11(M12): DI1-3
M11(M12): DI4-6
P
M11(M12): RO
M11(M12): RO1、RO2
M11(M12): pluse count
M11(M12): Counter 1
M11(M12): Counter 2
M11(M12): Counter 3
M11(M12): Counter 4
M11(M12): Counter 5
M11(M12): Counter 6
M21/M22
IO: M21 or M22
M21(M22): DI
M21(M22): DI1-4
M21(M22): AO
M21(M22): AO1、AO2 output
M21(M22): pulse count
M21(M22)：Counter 1
M21(M22)：Counter 2
M21(M22)：Counter 3
M21(M22)：Counter 4



Note: The figure shows the rolling sequence for using key P. If using E key for rolling page, the sequence will reverse.

3.7 Parameter Setting Mode

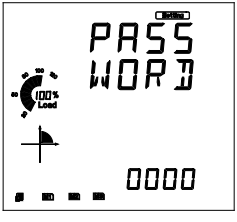
Press H and V/A simultaneously will activate the display mode selection and the cursor will flash. Press P or E to move the cursor right or left to "Setting", then press V/A key and you will enter the parameter setting mode.

In the parameter setting mode, parameters, such as system parameters, expanded I/O module parameters, alarm parameters and Ethernet module parameters, can be read and modified.

a) Password Inquiry:

Entering the parameter setting mode, firstly, the device address will appear for several seconds and then go to the password inquiry page. “Password” is the key to the parameter setting mode and only valid password will help you to go through and use the meter setting. This function helps to prevent the mis-operation and unauthorized people to modify the meter parameters. There are 4 digits of password in the meter, which can be set from “0000” to “9999” with the default value of “0000”. User should input the right password and press V/A key to go through to the parameter selection page; otherwise it will stay at the password inquiry page.

The following figure shows the password inquiry page.



Key functions when inputting password:

Press H, move the flashing cursor to the next position.
Press P, the flashing number will add one.
Press E, the flashing number will minus one.
Press V/A, confirm the password.

b) Parameter Selection Mode

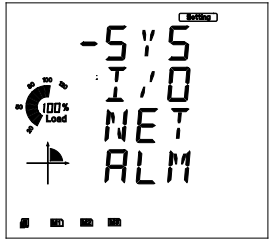
In the parameter selection mode, there are four parameters for choices: system, expanded I/O module, Ethernet module and alarms.

Press H, no function.

Press P, move the cursor downwards. When the cursor is at the bottom, press P will move the cursor to the top.

Press E, move the cursor upwards. When the cursor is at the top, press E will move the cursor to the bottom.

Press V/A, choose the parameter and enter the parameter modify mode.



The figure shows the parameter selection page. "SYS" stands for system parameter, "I/O" stands for expanded I/O module parameter, "NET" stands for Ethernet module parameter and "ALM" stands for alarm parameter. As shown in the figure, the cursor points to the "SYS", which means system parameter is selected.

c) System Parameter Setting

In the system parameter setting mode, firstly find the parameter and then modify.

Key functions for finding the parameter:

Press H, back to parameter selection mode.

The screen will roll to the next page each time when press P and will roll back to the first page when press P at the last page.

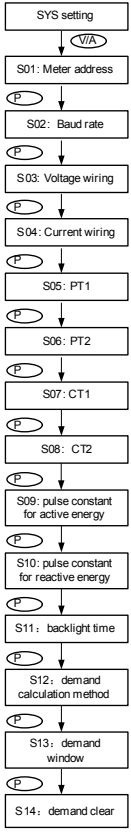
The screen will roll to the last page each time when press E and will roll back to the last page when press E at the first page.

Press V/A, confirm the parameter you want to modify, enter the modify mode.

Key functions for modifying the parameter:

Press H, move the flashing cursor to the next position.
Press P, the flashing number will add one.
Press E, the flashing number will minus one.
Press V/A, confirm the modification and back to parameter finding mode.

The following figure shows how it rolls:



Any integer from 1~247

Select form 600,1200, 2400,4800,9600,19200,38400 bps

Voltage wiring mode can be one of "3LN", "2LN", "2LL", "3LL"

Current wiring mode can be one of "3CT", "1CT", "2CT"

PT1: primary nominal value of PT, range from 50.0V~500,000.0V

PT2: secondary nominal value of PT, range from 50.0V~400.0V
If no PT used , set PT1 and PT2 as the nominal voltage of the meter.

CT1: primary value of CT, range from 1A~50000A；

CT2: secondary value of CT, choose from 1A or 5A；

Indicates the kWh for one pulse . Range from 1~6000 and the unit is 0.1kWh/pulse

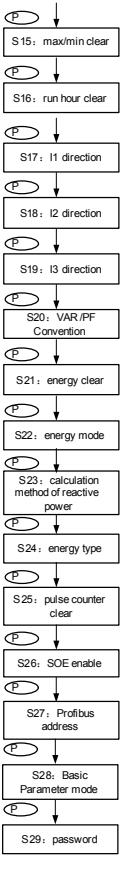
Indicates the kvarh for one pulse . Range from 1~6000 and the unit is 0.1kvarh/pulse

The "on" time can be set from 0 to 120 Minute. The backlight will always be "on" if the setting value is 0. If it is other value , it means after that long time it will goes off if no key has been pressed . It will be "on" whenever you press any key if it is "off" .。

1: sliding block, 2: thermal

Range from 1~30 minutes

Yes：clear; No：not clear



To clear the Max and Min value does not mean write 0 to all the registers, it will copy the metering value to the statistic registers and start a new statistic period .

Yes：clear; No：not clear

To adjust polarity of current , the three current's direction can be set as "Negative" which means reversing 180 degrees and "Positive" which means normal .

0: IEC, 1: IEEE

Yes：clear; No：not clear

Fund: fundamental; Full: full wave

0: true
1: generalized $Q = \sqrt{S^2 - P^2}$

Pre: primary energy;
Sec: secondary energy

Range from 0-6.
0: not clear; 1: AXM-IO11 clear; 2: AXM-IO21 clear; 3: AXM-IO31 clear; 4: AXM-IO12 clear; 5 AXM-IO22 clear; 6: AXM-IO32 clear;

Range from 0-6.
0: disable; 1: AXM-IO11 enable; 2: AXM-IO21 enable; 3: AXM-IO31 enable; 4: AXM-IO12 enable; 5 AXM-IO22 enable; 6: AXM-IO32 enable;

Any integer from 0-126

Pre: primary energy;
Sec: secondary energy

Last page of the system parameter setting . Set the password in this page and make sure to remember the new password , or you may not use the meter properly .

Note: The figure shows the rolling sequence for using key P. If using E key for rolling page, the sequence will reverse.

d) Expanded I/O Module Parameter

In the expanded I/O module parameter mode, firstly choose the module to be modified and then make the modification. If no expanded I/O module is connected, it will display "NO IO". At this time, Press H to go back to the parameter selection mode and other keys have no effect.

Key functions for I/O module selection:

Press H, back to parameter selection mode.
Press P, move the cursor downwards. When the cursor is at the bottom, press P will move the cursor to the top. If there is only one module connected, press P will have no effect.
Press E, move the cursor upwards. When the cursor is at the top, press E will move the cursor to the bottom. If there is only one module connected, press E will have no effect.
Press V/A, select the module and enter the I/O module parameter finding mode.

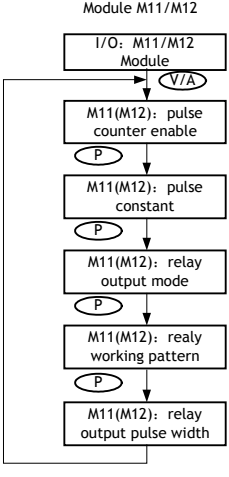
Key functions for finding the I/O module parameter:

Press H, back to I/O module selection mode.
The screen will roll to the next page each time when press P and will roll back to the first page when press P at the last page.
The screen will roll to the last page each time when press E and will roll back to the last page when press E at the first page.
Press V/A, confirm the parameter you want to modify, enter the modify mode.

Key functions for modifying the parameter:

Press H, move the flashing cursor to the next position.
Press P, the flashing number will add one.
Press E, the flashing number will minus one.
Press V/A, confirm the modification and back to parameter finding mode.

The following table shows how it rolls:



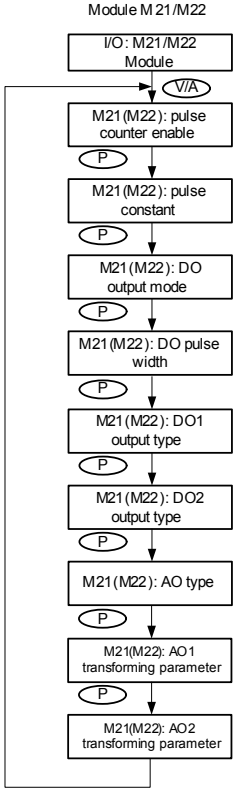
DI of AXM-IO1 can be used as the pulse counter, each DI function is correspond to one bit of a 8-bit register. The correspondence bit of 0 means that the DI works as the digital status input and the correspondence bit of 1 means that the DI works as the pulse counter. For example, if the setting value is 000001, it means that DI1 is set as the pulse counter and other DI works as he digital status input.

If the DI works as the pulse counter, then when pulse number counted by DI reach the pulse constant, the pulse counter will add by one, which means that the real pulse number equals the number of pulse counter times the pulse constant.

Relays of AXM-IO1 can be used as alarm output or control output. ALM:alarm output; CTRL:control output

When set as the control output, the relays have the working pattern of latch mode or pulse mode.
LATCH:latch mode; PUL:pulse mode

If the relay work pattern is pulse mode, it means that the relay will close for a specified period and then open automatically. The pulse width range is 50~3000 ms.



DI of AXM-IO2 can be used as the pulse counter, each DI function is correspond to one bit of a 8-bit register. The correspondence bit of 0 means that the DI works as the digital status input and the correspondence bit of 1 means that the DI works as the pulse counter. For example, if the setting value is 0001, it means that DI1 is set as the pulse counter and other DI works as he digital status input.

If the DI works as the pulse counter, then when pulse number counted by DI reach the pulse constant, the pulse counter will add by one, which means that the real pulse number equals the number of pulse counter times the pulse constant.

DO of AXM-IO1 can be used as alarm output or energy pulse output. ALM: alarm output; PUL: energy pulse output

Range from 20-1000 ms

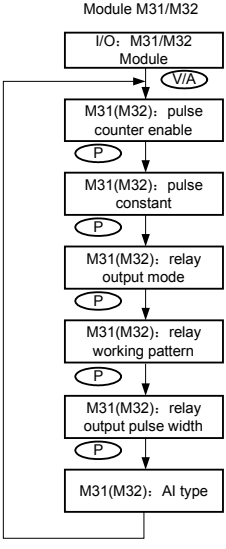
Choose the output energy type for DO1. Range from 0-4. 0: no output; 1: import active energy; 2: export active power; 3: import reactive energy; 4: export reactive energy.

The same as DO1. if the DO is set as the alarm output, this parameter will have no effect.

Range: 0~3. 0: 0-20mA; 1: 4-20mA; 2: 0-5V; 3: 1-5V

Range: 0~29, See Chapter 5

Range: 0~29, See Chapter 5



DI of AXM-IO3 can be used as the pulse counter, each DI function is correspond to one bit of a 8-bit register. The correspondence bit of 0 means that the DI works as the digital status input and the correspondence bit of 1 means that the DI works as the pulse counter. For example, if the setting value is 0001, it means that DI1 is set as the pulse counter and other DI works as he digital status input.

If the DI works as the pulse counter, then when pulse number counted by DI reach the pulse constant, the pulse counter will add by one, which means that the real pulse number equals the number of pulse counter times the pulse constant.

Relays of AXM-IO3 can be used as alarm output or control output. ALM:alarm output; CTRL:control output

When set as the control output, the relays have the working pattern of latch mode or pulse mode.
LATCH:latch mode; PUL:pulse mode

If the relay work pattern is pulse mode, it means that the relay will close for a specified period and then open automatically. The pulse width range is 50~3000 ms.

Range: 0~3. 0:0-20mA; 1:4-20mA; 2:0-5V; 3:1-5V

Note: The figure shows the rolling sequence for using key P. If using E key for rolling page, the sequence will reverse.

e) Ethernet Module Parameter

In the Ethernet module parameter mode, firstly find the parameter and then modify. If Ethernet module is not connected, all the settings will have no effect.

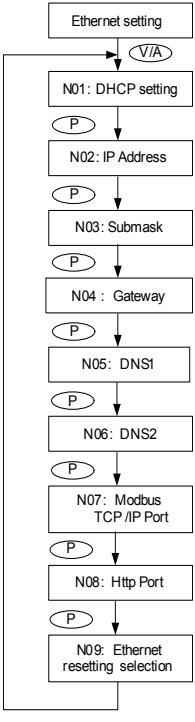
Key functions for finding the Ethernet module parameter:

Press H, back to parameter selection mode.
The screen will roll to the next page each time when press P and will roll back to the first page when press P at the last page.
The screen will roll to the last page each time when press E and will roll back to the last page when press E at the first page.
Press V/A, confirm the parameter you want to modify, enter the modify mode.

Key functions for modifying the parameter:

Press H, move the flashing cursor to the next position.
Press P, the flashing number will add one.
Press E, the flashing number will minus one.
Press V/A, confirm the modification and back to parameter finding mode.

The following figure shows how it rolls:


Ethernet setting
V/A
N01: DHCP setting
The selection of DHCP setting : MANU or AUTO
Default setting: MANU
P
N02: IP Address
IP address have four segments . Any segment can be set from 0~255.
Default setting: 192.168 .1.254
P
N03: Submask
Submask have four segments. Any segment can be set from 0~255.
Default setting: 255.255 .255.0
P
N04 : Gateway
Gateway have four segments. Any segment can be set from 0~255.
Default setting: 192.168 .1.1
P
N05: DNS1
DNS1 have four segments Any segment can be set from 0~255.
Default setting: 202.106 .0.20
P
N06: DNS2
DNS2 have four segments Any segment can be set from 0~255.
Default setting: 0.0.0.0
P
N07: Modbus TCP /IP Port
Range from 2000 -5999 , the default value is 502
P
N08: Http Port
Range from 6000 -9999 , the default value is 80
P
N09: Ethernet resetting selection
0: No resetting ; 1: Resetting; 2: Renew it to default setting, and then resetting it .

Note: The figure shows the rolling sequence for using key P. If using E key for rolling page, the sequence will reverse.

f) Alarm Parameter

In the alarm parameter mode, firstly find the parameter and then modify.

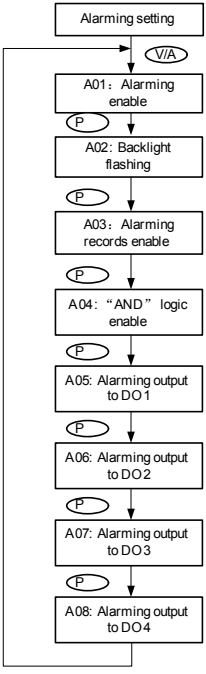
Key functions for finding the alarm parameter:

Press H, back to parameter selection mode.
The screen will roll to the next page each time when press P and will roll back to the first page when press P at the last page.
The screen will roll to the last page each time when press E and will roll back to the last page when press E at the first page.
Press V/A, confirm the parameter you want to modify, enter the modify mode.

Key functions for modifying the parameter:

Press H, move the flashing cursor to the next position.
Press P, the flashing number will add one.
Press E, the flashing number will minus one.
Press V/A, confirm the modification and back to parameter finding mode.

The following figure shows how it rolls:



Yes: alarming is available; No: means not.

It can be selected as cue signal for alarming.
Yes: the backlight will flashes; No: means not.

There are 16 records in all and each one is corresponding to one bit of a 16-bit register. For each record, it works or not depends on the enable setting. If some bits of the register are "1", it means their corresponding records take effect. While "0" means they don't work. on the panel, it is set as decimal but in the register it is binary, so it needs conversion.

There are eight group for "and" logic setting, which can enable the on-off control. One group have two records, when both of the conditional inequality are satisfied, alarming can output. The setting is denoted by Low 8-bit of the 16-bit register, each corresponds for one "and" logic (eight group in all). While "1" means enabled; 0 means not.

When DO1 works in alarming mode, it is controlled by a 16-bit register which determines which record will output to DO1. On the panel, it is set as decimal but in the register it is binary, so it needs conversion.

DO2, DO3 and DO4 are the same as DO1. DO1 and DO2 are the DO of AXM-IO21, DO3 and DO4 are the DO of AXM-IO22. They arrange in order.

Note: The figure shows the rolling sequence for using key P. If using E for rolling page, the sequence will reverse.

3.8 Page recovery Function

Acuvim II has the page recovery function, which means that the meter stores the current display page in the non-volatile memory during power off and reloads the page when power recovers. If power goes off when displaying at the parameter setting mode, the meter will start with page of voltage display when power recovers. If power goes off when displaying at the expanded I/O module data mode, and this expanded I/O module is not connected when power recovers, the meter will start with page of voltage display.

Chapter 4 Function and Software

Basic Analog Measurements

Max/Min

Harmonics and power quality analysis

Over-Range alarming

The function of Acuvim II is very powerful. It can measure almost all the parameters in the power system. Some of its function may not be controlled by simply pressing the keys, so we made this software to go with it. To express clearly, we'll introduce functions with the help of the software interface in this chapter. The version of the software you get may be advanced or it may differ somewhere, please refer to the manual that goes with it.

4.1 Basic Analog Measurements

Acuvim II can measure voltage, current, power, frequency, power factor and demand etc with high accuracy, shown as below:

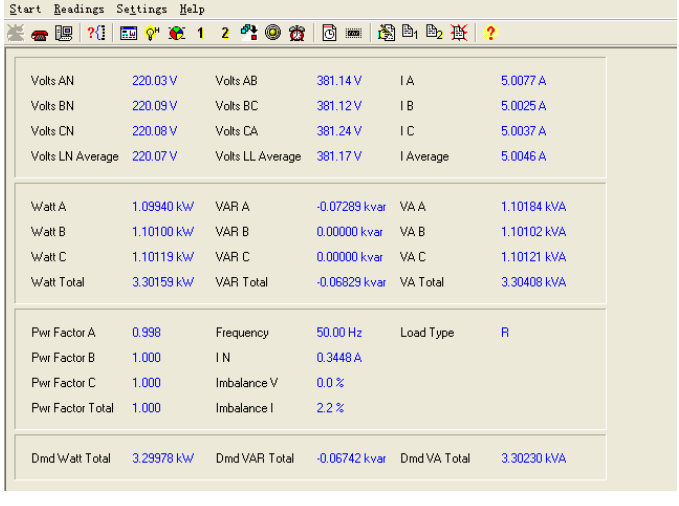

Start Readings Settings Help
Volts AN 220.03 V
Volts AB 381.14 V
I A 5.0077 A
Volts BN 220.09 V
Volts BC 381.12 V
I B 5.0025 A
Volts CN 220.08 V
Volts CA 381.24 V
I C 5.0037 A
Volts LN Average 220.07 V
Volts LL Average 381.17 V
I Average 5.0046 A
Watt A 1.09940 kW
VAR A -0.07289 kvar
VA A 1.10184 kVA
Watt B 1.10100 kW
VAR B 0.00000 kvar
VA B 1.10102 kVA
Watt C 1.10119 kW
VAR C 0.00000 kvar
VA C 1.10121 kVA
Watt Total 3.30159 kW
VAR Total -0.06829 kvar
VA Total 3.30408 kVA
Pwr Factor A 0.998
Frequency 50.00 Hz
Load Type R
Pwr Factor B 1.000
I N 0.3448 A
Pwr Factor C 1.000
Imbalance V 0.0 %
Pwr Factor Total 1.000
Imbalance I 2.2 %
Dmd Watt Total 3.29978 kW
Dmd VAR Total -0.06742 kvar
Dmd VA Total 3.30230 kVA

Fig 4.1 Real-Time Metering

Demand:

Types of demand calculated in Acuvim II are: active power demand of three phase, reactive power demand of three phases, and apparent power demand of three phases. Demand memory can be cleared. To clear is to reset all the registers to 0, like the initial of the meter (demand calculation only).

Demand calculating mode can be set as sliding window and thermal according to user. The figure 4-7 shows how it works.

In the sliding window interval, you select an interval from 1 to 30 minutes, which is the period of the calculation. The demand updates every 1 minute as the window sliding once.

Thermal demand method calculates the demand based on a thermal response which mimics the thermal demand meter. You select the period for the calculation and the demand updates at the end of each period.

Energy:

Various kinds of energy will be accumulated in Acuvim II. Real time energy: the accumulation of energy for the kWh, kvarh and kVAh since cleared last time.

Calculating mode

1. User can select calculating mode from fundamental based or full-wave based by pressing key or via communication. Fundamental based calculating is to accumulate energy ignoring harmonics while full-wave based calculating is to accumulate energy including fundamental and harmonics.

Note: When fundamental based calculating is selected, PF is that of

fundamental wave.

2. There are two ways to calculate reactive energy(power)

Mode 0: real reactive energy $Q = \sqrt{S^2 - P^2 - D^2}$

Mode 1: general reactive energy $Q = \sqrt{S^2 - P^2}$

3. User can choose primary energy or secondary energy by pressing key or via communication as shown in figure 4-7.

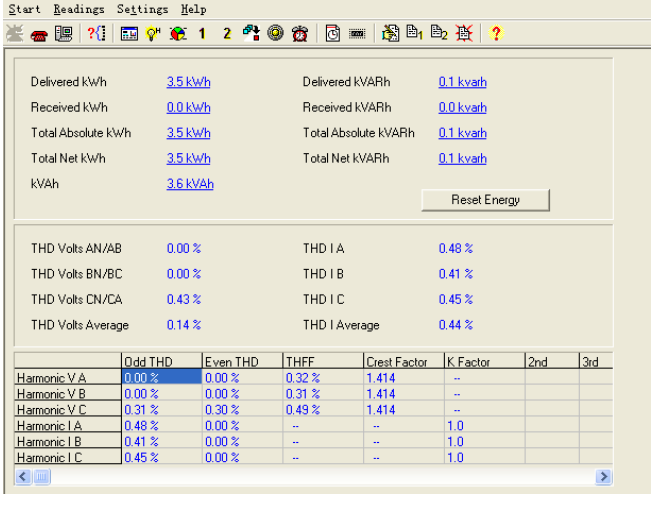

Start Readings Settings Help
Delivered kWh 3.5 kWh
Received kWh 0.0 kWh
Total Absolute kWh 3.5 kWh
Total Net kWh 3.5 kWh
kVAh 3.6 kVAh
Delivered kVARh 0.1 kvarh
Received kVARh 0.0 kvarh
Total Absolute kVARh 0.1 kvarh
Total Net kVARh 0.1 kvarh
Reset Energy
THD Volts AN/AB 0.00 %
THD Volts BN/BC 0.00 %
THD Volts CN/CA 0.43 %
THD Volts Average 0.14 %
THD I A 0.48 %
THD I B 0.41 %
THD I C 0.45 %
THD I Average 0.44 %
Odd THD Even THD THFF Crest Factor K Factor 2nd 3rd
Harmonic V A 0.00 % 0.00 % 0.32 % 1.414 --
Harmonic V B 0.00 % 0.00 % 0.31 % 1.414 --
Harmonic V C 0.31 % 0.30 % 0.49 % 1.414 --
Harmonic I A 0.48 % 0.00 % -- -- 1.0
Harmonic I B 0.41 % 0.00 % -- -- 1.0
Harmonic I C 0.45 % 0.00 % -- -- 1.0

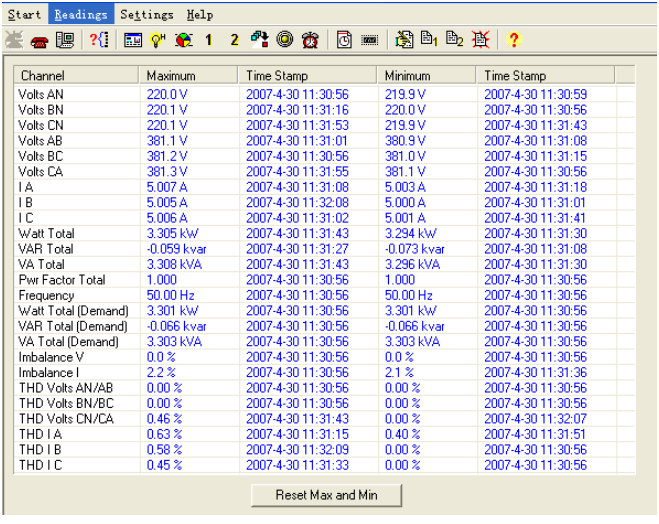
Figure 4-2 energy and power quality parameters

Current direction adjustment

The normal current direction is from port 1 to port 2, but sometimes

we may make wrong wiring. To adjust direction of current, the three current directions can be set as “Negative” which means reversing 180 degrees and “Positive” which means normal. It is easy to get the right data without changing the wiring. It is also shown in figure 4-7.

4.2 Max/Min



Channel	Maximum	Time Stamp	Minimum	Time Stamp
Volts AN	220.0 V	2007-4-30 11:30:56	219.9 V	2007-4-30 11:30:59
Volts BN	220.1 V	2007-4-30 11:31:16	220.0 V	2007-4-30 11:30:56
Volts CN	220.1 V	2007-4-30 11:31:53	219.9 V	2007-4-30 11:31:43
Volts AB	381.1 V	2007-4-30 11:31:01	380.9 V	2007-4-30 11:31:08
Volts BC	381.2 V	2007-4-30 11:30:56	381.0 V	2007-4-30 11:31:15
Volts CA	381.3 V	2007-4-30 11:31:55	381.1 V	2007-4-30 11:30:56
I A	5.007 A	2007-4-30 11:31:08	5.003 A	2007-4-30 11:31:18
I B	5.005 A	2007-4-30 11:32:08	5.000 A	2007-4-30 11:31:01
I C	5.006 A	2007-4-30 11:31:02	5.001 A	2007-4-30 11:31:41
Watt Total	3.305 kW	2007-4-30 11:31:43	3.294 kW	2007-4-30 11:31:30
VAR Total	-0.059 kvar	2007-4-30 11:31:27	-0.073 kvar	2007-4-30 11:31:08
VA Total	3.308 kVA	2007-4-30 11:31:43	3.296 kVA	2007-4-30 11:31:30
Pwr Factor Total	1.000	2007-4-30 11:30:56	1.000	2007-4-30 11:30:56
Frequency	50.00 Hz	2007-4-30 11:30:56	50.00 Hz	2007-4-30 11:30:56
Watt Total (Demand)	3.301 kW	2007-4-30 11:30:56	3.301 kW	2007-4-30 11:30:56
VAR Total (Demand)	-0.066 kvar	2007-4-30 11:30:56	-0.066 kvar	2007-4-30 11:30:56
VA Total (Demand)	3.303 kVA	2007-4-30 11:30:56	3.303 kVA	2007-4-30 11:30:56
Imbalance V	0.0 %	2007-4-30 11:30:56	0.0 %	2007-4-30 11:30:56
Imbalance I	2.2 %	2007-4-30 11:30:56	2.1 %	2007-4-30 11:31:36
THD Volts AN/AB	0.00 %	2007-4-30 11:30:56	0.00 %	2007-4-30 11:30:56
THD Volts BN/BC	0.00 %	2007-4-30 11:30:56	0.00 %	2007-4-30 11:30:56
THD Volts CN/CA	0.46 %	2007-4-30 11:31:43	0.00 %	2007-4-30 11:32:07
THD I A	0.63 %	2007-4-30 11:31:15	0.40 %	2007-4-30 11:31:51
THD I B	0.58 %	2007-4-30 11:32:09	0.00 %	2007-4-30 11:30:56
THD I C	0.45 %	2007-4-30 11:31:33	0.00 %	2007-4-30 11:30:56

Figure 4-3 Max/Min

Acuvim II can make statistics of the maximum and minimum values of phase/line voltages, currents, power, reactive power, apparent power, power factor, frequency, demand, unbalance factor, THD as well as the time they occur. All the data will be stored in non-volatile memory so

that they will not lose when the power supply is off. All of the maximum and minimum data can be accessed via communication or panel, but the time stamps can only be accessed via communication. The statics can be cleared via communication or panel.

4.3 Harmonics and Power Quality Analysis

1. Harmonics

Acuvim II can measure and analyze THD, Harmonics (2nd to 31st), even HD, odd HD, Crest Factor, THFF, K factor etc. They are shown in figure 4-2.

2. Phase angle:

Phase angle indicates the angle between U1 and other voltage and current parameters. It ranges from 0 to 360 degrees. This function is to help user find out the relationship between all input signals avoiding wrong wiring. When it is set to "2LL" or "3LL", it gives out the phase angles of u23, i1, i2, i3 corresponding to u12. For other settings, it gives out the phase angles of u2, u3, i1, i2, i3 corresponding to u1. They are shown in figure 4-4.

3. Sequence component and unbalance analysis

Acuvim II will do some sequential analysis for the input signal. It makes out the positive sequence, negative sequence and zero sequence of the fundamentals and does the unbalance analysis of voltage and current. Sequence components are shown in figure 4-4, unbalance of voltage and current are shown in figure 4-1.

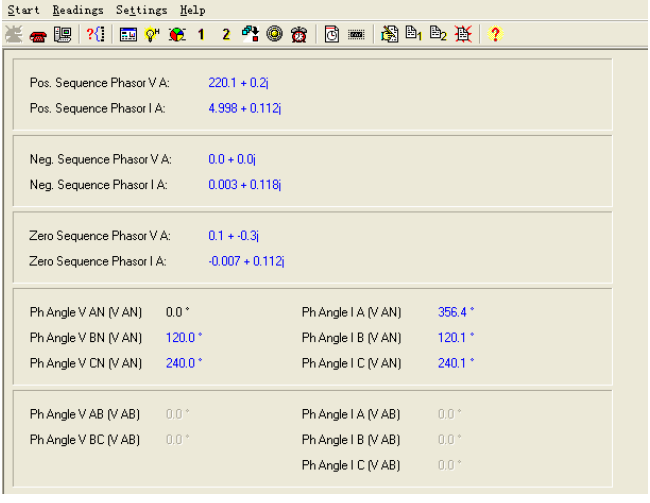

Start Readings Settings Help
Pos. Sequence Phasor V A: 220.1 + 0.2j
Pos. Sequence Phasor I A: 4.998 + 0.112j
Neg. Sequence Phasor V A: 0.0 + 0.0j
Neg. Sequence Phasor I A: 0.003 + 0.118j
Zero Sequence Phasor V A: 0.1 + -0.3j
Zero Sequence Phasor I A: -0.007 + 0.112j
Ph Angle V AN (V AN) 0.0 °
Ph Angle V BN (V AN) 120.0 °
Ph Angle V CN (V AN) 240.0 °
Ph Angle I A (V AN) 356.4 °
Ph Angle I B (V AN) 120.1 °
Ph Angle I C (V AN) 240.1 °
Ph Angle V AB (V AB) 0.0 °
Ph Angle V BC (V AB) 0.0 °
Ph Angle I A (V AB) 0.0 °
Ph Angle I B (V AB) 0.0 °
Ph Angle I C (V AB) 0.0 °

Figure 4-4 Sequence component and Phase angle

4.4 Over-Range Alarming

In Acuvim II, when the metering data is over the pre-setting limit and over pre-setting time interval, the over limit alarming will be picked up. The over limit value and time stamp will be recorded and the maximum number of records is 16. The digital output (DO) and RO can be used (if extended I/O modules are connected) as trigger to light or sound alarming.

In order to use the over-range alarming function, you should finish all the settings (equation or inequation or enable switches) correctly, or it will fail. All of the settings can be accessed by writing to their corresponding

registers via communication as shown in figure 4-5.

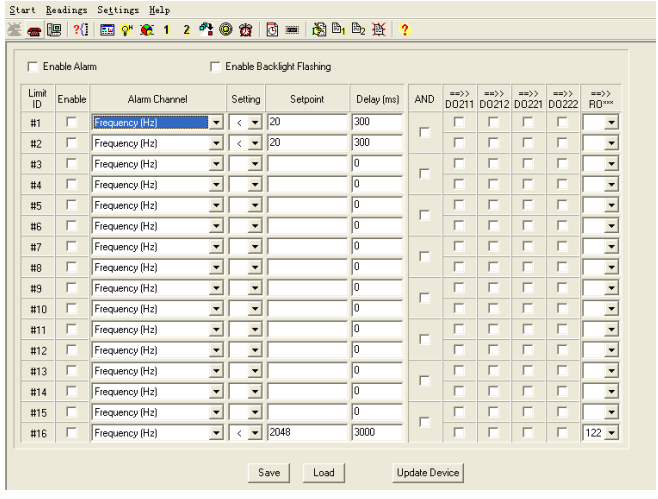


Figure 4-5 Alarm Setting

1. Single alarming group setting

Table 4-1 indicates the first group of settings, there are 16 groups in all with the same format.

Address	Parameter	Range	Property
104eH	First group: parameter code	0~44	R/W
104fH	First group: comparison mode	1:larger,2:equal,3:smaller	R/W
1050H	First group: setting value	Related with parameters	R/W
1051H	First group: delay time	0~3000(*10ms)	R/W
1052H	First group: output to relay	0:none,1-8:related relay	R/W

Table 4-1 first group of alarming settings

Parameter code: used to select a parameter for this group. For example: 0-frequency, 44-AI4 sampling data. Then this parameter will be monitored.

Comparison mode: set alarming condition 1: larger, 2: equal, 3: smaller. For example: if you choose frequency, larger, and setting value is 50, then it will alarm when the frequency is larger than 50Hz.

Notice: the relationship between communication setting value and actual value is the same as that of the selected parameter.

Delay time: if the alarms condition lasts for a specified time period, an alarm will be valid and recorded. It ranges from 0 to 3000 (unit: 10ms). When it is set to 0, there is no delay after the condition is setup. If it is set to 20, it will delay 20*10=200ms.

Output to relay: 0-the alarming will not output to RO, if it is set as 1 and AXM-IO11 is connected, it will output to RO1 when alarm happens and RO1 will be turned off until all alarms output to RO1 are reset. RO2~RO8 are the same as RO1.

Notice: if RO is under alarming mode, it can only work in "latch" mode.

After single alarming group setting is finished, you need to go on and finish the following global setting or the alarming won't work.

2. Global settings

The addresses of all the global variables are 1046H~104dH in system parameters.

"Global alarming enable" determines whether the alarming function of this meter works or not. Only when it is set as "1", the alarming function is enabled.

When “Alarming flash enable“ is set to be “1”, the backlight will flash when alarm happens.

“Alarming channel enable setting” determines whether the corresponding group is enabled or not. There are 16 groups in all and each one is corresponding to one bit of a 16-bit register. For each group, whether it works or not depends on the enable setting. If some bits of the register are “1”, it means their corresponding groups take effect.

“Logical “And” between alarming setting”: The 16 alarming records in Acuvim II are divided into 8 pairs. Each pair has two groups. The two groups can be logically “and” by controlling the logic switch. When two groups are “and”, the alarming happens only if both the conditions are met. If the switch is off, the two groups work independently.

The 8 pairs are arranged as following: according to their serial number, the 1st,2nd make as Pair 1; the 3rd,4th make as Pair 2; the 5th,6th make as Pair 3; 7th,8th make as Pair 4; 9rd,10th make as Pair 5; 11th,12th make as Pair 6; 13th,14th make as Pair 7; 15th,16th make as Pair 8.

This function is controlled by the lower 8 bits of 16 bits register, each bit is corresponding to a pair. “1” means this function is enabled and “0” means disabled.

“Alarming output to DO1 setting”: When “Digital output mode” is set to “1”, DO1 can be used as alarming output. A 16-bit register is used to finish this function, its bit0~bit15 are corresponding to the 1st ~16th group respectively. When the related I/O module is connected and under alarms mode, if corresponding bit is set to 1 and the alarming condition is met, then it will output to DO1 and DO1 will be turned off until all alarms output to DO1 are reset. If related bit is set to 0, it doesn’t affect DO1.

DO2~DO4 are the same as DO1.

After finishing the previous steps correctly, the alarming function is available.

3. Setting Example

We'll show you an example of how to use the logical "and" in a pair.

We set an event as follow: I1 greater than 180A, delay 5s for the 1st group; U1 less than 9980V, delay 10s for the 2nd group. No output is available. The CT primary value of I1 is 200A, and CT2 is 5A. The primary voltage of U1 is 10000V, PT2 is 100V. Then let's look how all the related registers are to be set.

Settings of first group:

"Parameter code (104eH)" is set to 9, which stands for I1.
"Comparison mode (104fH)" is set to 1, which stands for larger.
"Setting value (1050H)" is set to 4500, according to the relationship between actual value and communication value (I=Rx *（CT1/CT2）/1000).
"Delay time (1051H)" is set to 500, so the actual delay time is 500*10ms=5s.
"Output to relay (1052H)" is set to 0, because there is no output to RO.

Settings of second group:

"Parameter code (1053H)" is set to 1, which stands for U1.
"Comparison mode (1054H)" is set to 3, which stands for smaller.
"Setting value (1055H)" is set to 998, according to the relationship between actual value and communication value (U=Rx X（PT1/PT2）/10).
"Delay time (1056H)" is set to 1000, so the actual delay time is

1000*10ms=10s.
“Output to relay (1057H)” is set to 0, because there is no output to RO.

Global settings:

“Alarming channel enable setting (1048H)” is set as 0x0003, which enables the first and the second channel.

“Logical "AND" between alarming setting (1049H)” is set as 0x0001, which enable logic "AND" in Pair 1.

“Alarming output to DO1 setting (104aH)” is set to 0, because there is no output to DO1.

“Alarming output to DO2 setting (104bH)” is also set to 0.

“Alarming output to DO3 setting (104cH)” is also set to 0.

“Alarming output to DO4 setting (104dH)” is also set to 0.

“Alarming flash enable (1047H)” is set to 0, which does not enable backlight flashing when alarming is occurred.

“Global alarming enable (1046H)” is set to 1, which enables the Over-Range alarming.

4. Records of Alarming Event

There are 16 groups of records of alarming event to be stored. But they are not corresponding to setting records, they are recorded in cycle. The latest event will cover the oldest one. It begins at the 1st record when the power is turned on. When over range parameters return to normal, the time stamp and value will be recorded as well. So user can work out the duration of over range by checking the changing time.

Here is the 1st group of record. Other groups of records have the same format.

Address	Parameter	Range
42a9H	First group: alarming status	0~65535
42aaH	First group: parameter code	0~44
42abH	First group: over range or reset value	Related with parameters
42acH~42b2H	First group: occur time: yyyy:mm:dd:hh:mm:ss:ms	time

Table 4-2 alarming status of the 1st group of record

"Alarming status" indicates information of current alarm status. It is a 16-bit unsigned integer. Parameter code is stored in the higher 8 bits. Bit1 indicates whether logic "AND" is enabled or not, 1 means enabled and 0 means not. Bit0 indicates whether alarming is occurred or recovered, 1 means occurred and 0 means recovered.Undefined bits are 0.

"Parameter code" indicates which parameter is recorded.

"Value" indicates the recorded value when alarm happens and recovers.

"Time" indicates the time stamp with the accuracy of ms.

Alarming event will set bit0 of "system status (102eH)" to be 1. At the same time, corresponding flags will be set to 1 to indicate new data. It should be cleared after controller has read the data, and then bit0 of "system status (102eH)" will be set to 0.

Note: alarming records will not lose during power off. The pointer will point to the 1st group of record after it is powered on again.

Here is an example:

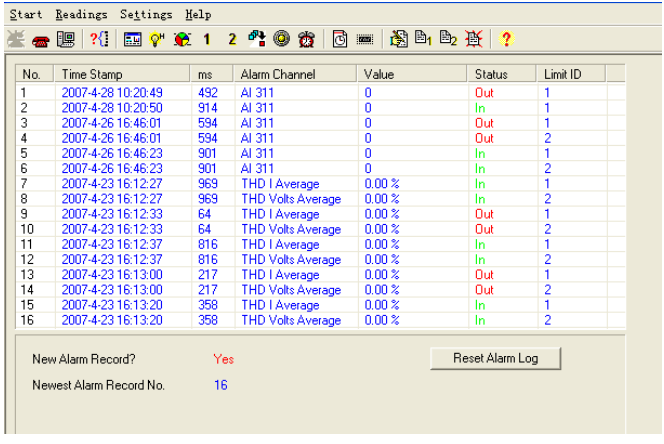


Fig 4-6 Alarming records

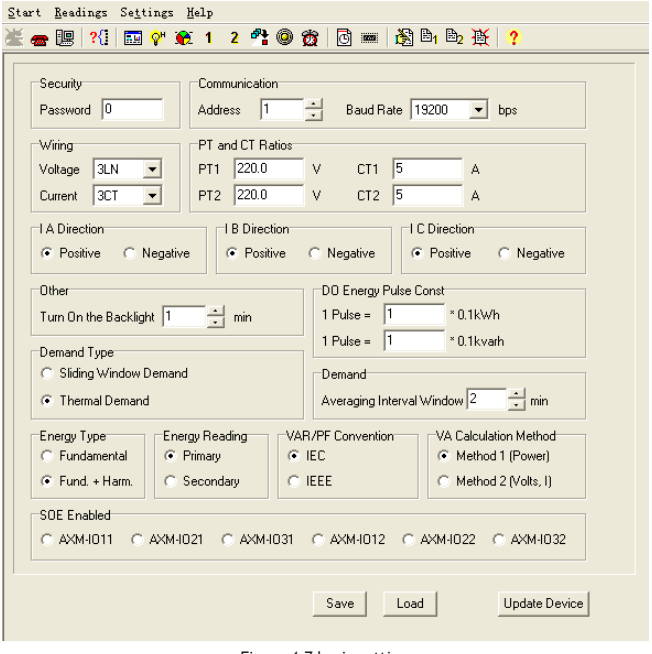


Figure 4-7 basic settings

4.5 Extended I/O Module

Please refer to <<User's manual of Extended I/O Modules>>.

4.6 Extended Communication Block

Please refer to <<User's manual of Ethernet Module>>and <<Use's manual of Profibus Module>>.

Chapter 5 Function and Software

Introducing Modbus Protocol

Format of the communication

Data Address Table and Application Details of Acuvim II

This chapter will mainly discuss how to handle the meter via the communication port using software. To master this chapter, you should be familiar with Modbus and have read other chapters of this manual, and you have generously mastered the function and application of this product.

This chapter includes: Modbus protocol, format of communication and data address table and Acuvim II application details.

5.1 Introducing Modbus Protocol

The Modbus RTU protocol is used for communication in Acuvim II. The data format and error check methods are defined in Modbus protocol. The half duplex query and respond mode is adopted in Modbus protocol. There is only one master device in the communication net. The others are slave devices, waiting for the query of the master.

Transmission mode

The mode of transmission defines the data structure within a frame and the rules used to transmit data. The mode is defined in the following which is compatible with Modbus RTU Mode*.

Coding System	8-bit binary
Start bit	1
Data bits	8
Parity	no parity
Stop bit	1
Error checking	CRC check

Framing

Address	Function	Data	Check
8-Bits	8-Bits	N×8-Bits	16-Bits

Table5.1 Data Frame Format

Address Field

The address field of a message frame contains eight bits. Valid slave device addresses are in the range of 0~247 decimal. A master addresses a slave by placing the slave address in the address field of the message. When the slave sends its response, it places its own address in this address field of the response to let the master know which slave is responding.

Function Field

The function code field of a message frame contains eight bits. Valid codes are in the range of 1~255 decimal. When a message is sent from a master to a slave device the function code field tells the slave what kind of action to perform.

Code	Meaning	Action
01	Read Relay Output Status	Obtain current status of Relay Output
02	Read Digital Input(DI) Status	Obtain current status of Digital Input
03	Read Data	Obtain current binary value in one or more registers
05	Control Relay Output	Force Relay to a state of on or off
16	Press Multiple-Register	Place specific binary values into a series of consecutive Multiple-Registers

Table5.2 Function Code

Data Field

The data field is constructed using sets of two hexadecimal digits, in the range of 00 to FF hexadecimal. The data field of messages sent from a master to slave devices contains additional information which the slave must use to take the action defined by the function code. This can include items like discrete and register addresses, the quantity of

items to be handled, and the count of actual data bytes in the field. For example, if the master requests a slave to read a group of holding registers (function code 03), the data field specifies the starting register and how many registers are to be read. If the master writes to a group of registers in the slave (function code 10 hexadecimal), the data field specifies the starting register, how many registers to write, the count of data bytes to follow in the data field, and the data to be written into the registers.

If no error occurs, the data field of a response from a slave to a master contains the data requested. If an error occurs, the field contains an exception code that the master application can use to determine the next action to be taken. The data field can be nonexistent (of zero length) in certain kinds of messages.

Error Check Field

Messages include an error's checking field that is based on a Cyclical Redundancy Check (CRC) method. The CRC field checks the contents of the entire message. It is applied regardless of any parity check method used for the individual characters of the message. The CRC field is two bytes, containing a 16 bit binary value. The CRC value is calculated by the transmitting device, which appends the CRC to the message.

The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, an error will result. The CRC is started by 66 first preloading a 16-bit register to all 1's. Then a process begins of applying successive 8-bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits, and the parity bit, do

not apply to the CRC. During generation of the CRC, each 8-bit character is exclusive ORed with the register contents. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was a1, the register is then exclusive ORed with a preset, fixed value. If the LSB was a 0, no exclusive OR takes place. This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next 8-bit byte is exclusive ORed with the register current value, and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value. When the CRC is appended to the message, the low-order byte is appended first, followed by the high-order byte.

5.2 Format of Communication

Explanation of frame

Addr	Fun	Data start reg hi	Data start reg lo	Data #of regs hi	Data #of regs lo	CRC 16 Hi	CRC 16 Lo
06H	03H	00H	00H	00H	21H	84H	65H

Table 5.3 Explanation of frame

In table5.3, the meaning of each abbreviated word is,

Addr: address of slave device
Fun: function code
Data start reg hi: start register address high byte
Data start reg lo: start register address low byte
Data #of reg hi: number of register high byte
Data #of reg lo: number of register low byte
CRC16 Hi: CRC high byte
CRC16 Lo: CRC low byte

1. Read Status of Relay

Function Code 01

This function code is used to read status of relay in Acuvim II.
1=On 0=Off
Relay1's address is 0x0000, Relay2's address is 0x0001, and so on.
The following query is to read relay status of Acuvim II with the address of 17.

Query

Addr	Fun	Relay start reg hi	Relay start reg lo	Relay #of regs hi	Relay #of regs lo	CRC 16 Hi	CRC 16 Lo
11H	01H	00H	00H	00H	02H	BFH	5BH

Table 5.4 Read the status of Relay1 and Relay2 Query Message

Response

The Acuvim II response includes the Acuvim II address, function code, quantity of data byte, the data, and error checking. An example response to read the status of Relay1 and Relay2 is shown as Table5.5. The status of Relay1 and Relay2 are responding to the last 2 bits of the data.

Relay1: bit0 Relay2: bit1

Address	Function code	Byte count	Data	CRC high	CRC low
11H	01H	01H	02H	D4H	89H

Table 5.5 Relay status responds

The content of the data is:

7	6	5	4	3	2	1	0
0	0	0	0	0	0	1	0

MSB LSB

Relay1 = OFF (LSB), Relay2=ON (Left to LSB)

2. Read the Status of DI

Function Code 02

1=On 0=Off

DI1's address is 0x0000, DI2's address is 0x0001, and so on.

The following query is to read the Status of 4 DIs of Acuvim II with the address of 17.

Query

Addr	Fun	DI start addr hi	DI start addr lo	DI num hi	DI num lo	CRC 16 Hi	CRC 16 Lo
11H	02H	00H	00H	00H	04H	7BH	59H

Table 5.6 Read 4 DIs Query Message

Response

The Acuvim II response includes the Acuvim II address, function code, quantity of data characters, the data characters, and error checking. An example response to read the status of 4 DIs are shown as Table 5.7. The status of 4 DIs are responding to the last 4 bits of the data.

DI1: bit0; DI2: bit1; DI3: bit2; DI4: bit3.

Address	Function code	Byte count	Data	CRC high	CRC low
11H	02H	01H	03H	E5H	49H

Table 5.7 Read Status of DI

The content of the data is:

7	6	5	4	3	2	1	0
0	0	0	0	0	0	1	1

MSB LSB

DI1=On, DI2=On, DI3=Off, DI4=Off.

3. Read Data (Function Code 03)

Query

This function allows the master to obtain the measurement results of Acuvim II. Table5.8 is an example to read the 3 measured data (F, V1 and V2) from slave device number 17, the data address of F is 4000H, 4001H; V1's address is 4002H, 4003, and V2's address is 4004H, 4005H.

Addr	Fun	Data start addr hi	Data start addr lo	Data #of regs hi	Data #of regs lo	CRC 16 regs Hi	CRC 16 regs Lo
11H	03H	40H	00H	00H	06H	D2H	98H

Table 5.8 Read F, V1, V2 Query Message

Response

The Acuvim II response includes the Acuvim II address, function code, quantity of data byte, data, and error checking. An example response to read F, V1 and V2 (F=42480000H (50.00Hz), V1=42C7CCCDH (99.9V), V2=42C83333H (100.1V)) is shown:

Addr	Fun	Byte count	Data1 hi	Data1 Lo	Data 2 hi	Data2 lo	Data3 hi	Data3 lo	Data4 hi	Data4 lo
11H	3H	0CH	42H	48H	00H	00H	42H	C7H	CCH	CDH

Data5 hi	Data5 Lo	Data 6 hi	Data6 lo	CRC16 hi	CRC16 lo
42H	C8H	33H	33H	CAH	7FH

Table 5.9 Read F, V1 and V2 Message

4. Control Relay (Function Code 05)

Query

This message forces a single relay either on or off. Any relay that exists within the Acuvim II can be forced to be either status (on or off). The

data value FF00H will set the relay on and the value 0000H will turn it off; all other values are illegal and will not affect that relay.

The example below is a request to the Acuvim II with the address of 17 to turn on Relay1.

Addr	Fun	DO addr hi	DO addr lo	Value hi	Value lo	CRC 16 Hi	CRC 16 Lo
11H	05H	00H	00H	FFH	00H	8EH	AAH

Table5.10 Control Relay Query Message

Response

The normal response to the command request is to retransmit the message as received after the relay status has been altered.

Addr	Fun	Relay addr hi	Relay addr lo	Value hi	Value lo	CRC Hi	CRC Lo
11H	05H	00H	00H	FFH	00H	8EH	AAH

Table5.11 Control Relay Response Message

5. Preset / Reset Multi-Register (Function Code 16)

Query

Function 16 allows the user to modify the contents of a Multi-Register. Some Registers of Acuvim II can have their contents changed by this message. The example below is a request to an Acuvim II with the address of 17 to preset Ep_imp as "17807783.3KWh", while its HEX value is 0A9D4089H. Ep_imp data address is 0x4048 and 0x4049.

Addr	Fun	Data start reg hi	Data start reg lo	Data #of reg hi	Data #of reg lo	Byte Count
11H	10H	40H	48H	00H	02H	04H

Value hi	Value Lo	Value hi	Value lo	CRC hi	CRC lo
0AH	9DH	40H	89H	F1H	6AH

Table5.12 Preset Multi-Register Query Message

Response

The normal response to a preset Multi-Register request includes the Acuvim II address, function code, data start register, the number of registers, and error checking.

Addr	Fun	Data start reg hi	Data start reg lo	Data #of reg hi	Data #of Reg lo	CRC16 hi	CRC16 lo
11H	10H	40H	48H	00H	02H	D6H	8EH

Table5.13 Preset Multi-Register Response Message

5.3 Data Address Table and Application Details of Acuvim II

There are several rules to follow in using the meter:

1. Data type:

"bit" refers to binary.

"word" refers to 16-bit unsigned integer using one data address and 2 bytes of memory, it varies from 0 to 65535.

"int" refers to 16-bit integer using one data address and 2 bytes of memory, it varies from -32768 to32767.

"dword" refers to 32-bit unsigned integer using two data addresses and 4 bytes of memory with high word at the front and low word at the end, it varies from 0 to 4294967295. Rx=high word *65536+low word.

"float" refers to 32-bit single value using two data addresses and 4 bytes of memory, it varies from -1.175494E-38 to 3.402823E+38.

2. Relationship between communication value and numerical value.

The numerical value may not the communication value, it is important to notice this. The following table shows how they respond to each other.

Parameters	Relationship	Unit	Format code
System parameters	Numerical value equals to communication value	No unit	F1
Run time	T=Rx/100	Hour	F2
Clock	Numerical value equals to communication value	Unit of time	F3
Energy(primary)	Ep=Rx/10	kWh	F4
Reactive energy(primary)	Eq=Rx/10	kvarh	F5
Apparent energy(primary)	Es=Rx/10	KVA	F6
Energy(secondary)	Ep=Rx/1000	KWh	F7
Reactive energy (secondary)	Eq=Rx/1000	Kvarh	F8
Apparent energy (secondary)	Es=Rx/1000	KVA	F9
frequency	F=Rx/100	Hz	F10
Voltage	U=Rx X(PT1/PT2)/10	V	F11
Current	I=Rx X(CT1/CT2)/1000	A	F12
Power, demand	P=Rx X(PT1/PT2)X(CT1/CT2)	W	F13
Reactive power, demand	Q=Rx X(PT1/PT2)X(CT1/CT2)	var	F14
Apparent power, demand	S=Rx X(PT1/PT2)X(CT1/CT2)	VA	F15
Power factor	PF=Rx/1000	No unit	F16
Unbalance factor	Unbl=(Rx/1000)X100%	No unit	F17
THD	THD=(Rx/10000) X 100%	No unit	F18
Harmonics	HDn=(Rx/10000) X 100%	No unit	F19
Total odd HD	HDo=(Rx/10000) X 100%	No unit	F20
Total even HD	HDe=(Rx/10000) X 100%	No unit	F21
Crest factor	CF=Rx/1000	No unit	F22
K factor	KF=Rx/10	No unit	F23

THFF	THFF=(Rx/10000) X 100%	No unit	F24
Phase angle	Phase angle=Rx/10	Degree	F25
temperature	Temperature= Rx/10	˚C	F26

Important Note: Regions from “System parameters settings” to “AO transforming parameter settings” are the regions that can be set and modified. Please follow the rules when you communicate with Acuvim II.

1. Using function code 10H, one communication order can only modify contents in one region, such as “System parameters settings”, ”System status parameter”, “Date and Time table”, “Over-range alarming-Global settings”, “Over-range alarming-Single settings”, “I/O Modules settings”. It can not be accomplished in one communication order to modify contents in both of two or more regions above.

2. Using function code 03H, there is no such rules described above.

System parameter setting

System parameters determine how the meter works. User should understand them clearly by referring to chapter 3 and chapter 4.

Function code: 03H for reading, 10H for presetting. Data type: word. Format code: F1.

Address	Parameter	Default	Range	
1000H	Pass Word	0	0~9999	R/W
1001H	Communication Address	1	1~247	R/W
1002H	Baud Rate	19200	600~38400	R/W
1003H	Voltage Input Wiring Type	0	0:3LN,1:2LN,2:2LL,3:3LL	R/W
1004H	Current Input Wiring Type	0	0:3CT,1:1CT,2:2CT	R/W
1005H	PT1 (High 16 bit)	0	50.0~500000.0	R/W
1006H	PT1 (Low 16 bit)	220.0		R/W

1007H	PT2	220.0	50.0~400.0	R/W
1008H	CT1	5	1~50000	R/W
1009H	CT2	5	1,5	R/W
100aH	kWh pulse constant	1	1~6000	R/W
100bH	kvarh pulse constant	1	1~6000	R/W
100cH	LCD Back light Time	1	0-120	R/W
100dH	Demand Slid Window Time	15	1~30	R/W
100eH	Demand calculating mode	1	1:sliding window 2:thermal	R/W
100fH	Clear demand memory	0	Only 1 works	R/W
1010H	Max/Min clear	0x55	Only 0x0A works	R/W
1011H	Run time clear	0	Only 1 works	R/W
1012H	Current I1 direction	0	0: Positive 1: Negative	R/W
1013H	Current I2 direction	0	0: Positive 1: Negative	R/W
1014H	Current I3 direction	0	0: Positive 1: Negative	R/W
1015H	VAR/PF convention	0	0:IEC,1:IEEE	R/W
1016H	Energy clear	0	Only 1 works	R/W
1017H	Energy calculating mode	1	0:fundamental 1:full-wave	R/W
1018H	Reactive power measuring mode	0	0:real,1:general	R/W
1019H	Energy display mode	0	0:primary，1:secondary	R/W
101aH	Ethernet Module reset	0	0:none, 1:reset, 2:load default and reset	R/W
101bH	SOE enable	0	0:none; 1:AXM-IO11; 2:AXM-IO21; 3:AXM-IO31; 4:AXM-IO12; 5:AXM-IO22; 6:AXM-IO32;	R/W

101cH	Pulse counter clear	0	0:none; 1:AXM-IO11; 2:AXM-IO21; 3:AXM-IO31; 4:AXM-IO12; 5:AXM-IO22; 6:AXM-IO32;	R/W
101dH	Basic parameter mode	0	0:secondary; 1:primary	R/W

System status parameter

"System status" indicates what events happened in the meter, what kinds of flags are read by user and to be the index of the storage of the events. Flags should be cleared after being read by the controller, otherwise new data will not be stored properly.

Function code: 03H for reading, 10H for writing. Data type: word.

Address	Parameter	Format code	Range	Property
101eH~102dH	Recording pointer bj_st0-15		1: new data	R/W
102eH	System status		Bit0:new alarming or not Bit1 new SOE or not	R
102fH~ 1031H	Reserved			
1032H	Alarming group number	F1	0~15	R
1033H	SOE group number	F1	0~19	R
1034H	Run time (high)	F2	0~999999999	R
1035H	Run time (low)			R
1036H	Expanded IO Modules connecting status		Bit0: AXM-IO11; Bit1:AXM-IO12; Bit2:AXM-IO21; Bit3: AXM-IO22; Bit4:AXM-IO31; Bit5:AXM-IO32; 0:disconnected 1:connected	R
1037H	Temperature	F26		R
1038H~103fH	Reserved			

Please refer to chapter 3 and chapter 4 for more details about parameter settings.

Date and Time table

Function code: 03H for reading, 10H for presetting.

Address	Parameter	Format code	Range	Property
1040H	Year	F3	2000-2099	R/W
1041H	Month	F3	1-12	R/W
1042H	Day	F3	1-31	R/W
1043H	Hour	F3	0-23	R/W
1044H	minute	F3	0-59	R/W
1045H	second	F3	0-59	R/W

Over-range alarming setting

This setting consists of global settings and single settings. The global settings contain settings of all global variables. There are 16 groups of records with the same format. Function code: 03H for reading, 10H for writing. Please refer to chapter 4 for more details.

Global settings

Address	Parameter		Range	Property
1046H	Global alarming enable		0:disable;1:enable	R/W
1047H	Alarming flash enable		0:disable;1:enable	R/W
1048H	Alarming channel enable setting		0-65535 Bit0:channel 1 1:enable; 0:disable Bit1: channel 2 ..... Bit15: channel 16	R/W

1049H	Logical “And ” between alarming setting		0~255 Bit0: first logic switch 1:enable;0:disable Bit1: second logic switch ..... Bit7: eighth logic switch	R/W
104aH	Alarming output to DO1 setting		0~65535 Bit0: channel 1 output 1:enable;0:disable Bit1: channel 2 output ..... Bit15: channel 16 output	R/W
104bH	Alarming output to DO2 setting		0~65535 The same as previous	R/W
104cH	Alarming output to DO3 setting		0~65535 The same as previous	R/W
104dH	Alarming output to DO4 setting		0~65535 The same as previous	R/W

Single settings

Address	Parameter	Format code	Range	Property
104eH	First group: parameter code	F1	0~44	R/W
104fH	First group: comparison mode	F1	1:more, 2: equal, 3:less	R/W
1050H	First group: setting value	F10~F18	Related with parameters	R/W
1051H	First group: delay	F1	0~3000(*10ms)	R/W
1052H	First group: output to relay	F1	0:none, 1-8: related relay	R/W
1053H~ 109dH	2nd to 16th group		Same as the first group	R/W

Alarming parameter code table

Setting value	Alarming object		Alarming object		Alarming object
0	frequency	1	Va	2	Vb
3	Vc	4	Average phase voltage	5	Uab
6	Ubc	7	Uca	8	Average line voltage
9	Line current of phase A	10	Line current of phase B	11	Line current of phase C
12	Average line current	13	Neutral current	14	Power of phase A
15	Power of phase B	16	Power of phase C	17	Power of all
18	Reactive power of phase A	19	Reactive power of phase B	20	Reactive power of phase C
21	Reactive power of all	22	Apparent power of phase A	23	Apparent power of phase B
24	Apparent power of phase C	25	Apparent power of all	26	PF of A
27	PF of B	28	PF of C	29	PF
30	Voltage unbalance factor U_unbl	31	Current unbalance factor I_unbl	32	Load characteristic(R/L/C)
33	THD_V1(V1 or V12)	34	THD_V2(V2 or V31)	35	THD_V3(V3 or V23)
36	Average THD_V	37	THD_I1	38	THD_ I2
39	THD_ I3	40	Average THD_I	41	AI1 sampling value
42	AI2 sampling value	43	AI3 sampling value	44	AI4 sampling value

I/O Modules settings

These settings are for some extended I/O modules, if there is no any extended I/O modules, all the settings are of no use. Please check the I/O connecting status before you do any settings. Function code: 03H for reading, 10H for writing. Please refer to <<User's manual of extended I/O Modules>>for more details.

AXM-IO11

Address	Parameter	Default	Range	Property
109eH	DI1-6 type	0	Bit0-DI1, Bit1-DI2 Bit2-DI3, Bit3-DI4 Bit4-DI5, Bit5-DI6 0-DI,1-pulse counter	R/W
109fH	DI pulse constant	0	1~65535	R/W
10a0H	Working mode of relay 1 and 2	0	0-control output 1-alarming output	R/W
10a1H	Output mode of relay 1 and 2	0	0-latch, 1-momentary	R/W
10a2H	Pulse width	50	50-3000ms	R/W

AXM-IO21

Address	Parameter	Default	Range	Property
10a3H	DI7-10 type	0	Bit0-DI7, Bit1-DI8 Bit2-DI9, Bit3-DI10 0-DI,1-pulse counter	R/W
10a4H	DI pulse constant	0	1~65535	R/W
10a5H	Working mode of DO	0	0-pulse output 1-alarming output	R/W
10a6H	DO pulse width	20	20-1000ms	R/W
10a7H	DO1 output	0	0-none 1-consumption power 2-gererating power 3-absorption reactive power 4-generating reactive power	R/W

10a8H	DO2 output	0	Same as above	R/W
10a9H	AO1,2 type	0	0:0-20mA, 1:4-20mA,2:0-5V, 3:1-5V	R/W

AXM-IO31

Address	Parameter	Default	Range	Property
10aaH	DI11-14 type	0	Bit0-DI11,Bit1-DI12, Bit2-DI13, Bit3-DI14 0-DI,1-pulse counter	R/W
10abH	DI pulse constant	0	1-65535	R/W
10acH	Working mode of relay 3 and 4	0	0-control output 1-alarming output	R/W
10adH	Output mode of relay 3 and 4	0	0-latch, 1-momentary	R/W
10aeH	Pulse width	50	50-3000ms	R/W
10afH	AI1,2 type	0	0:0-20mA, 1:4-20mA, 2:0-5V, 3:1-5V	R/W

AXM-IO12

Address	Parameter	Default	Range	Property
10b0H	DI15-20 type	0	Bit0-DI15,Bit1-DI16, Bit2-DI17,Bit3-DI18, Bit4-DI19, Bit5-DI20 0-DI,1-pulse counter	R/W
10b1H	DI pulse constant (high)	0	1-65535	R/W
10b2H	Working mode of relay 5 and 6	0	0-control output 1-alarming output	R/W
10b3H	Output mode of relay 5 and 6	0	0-latch,1-momentary	R/W
10b4H	Pulse width	50	50-3000ms	R/W

AXM-IO22

Address	Parameter	Default	Range	Property
10b5H	DI21-24 type	0	Bit0-DI21,Bit1-DI22, Bit2-DI23, Bit3-DI24 0-DI,1-pulse counter	R/W
10b6H	DI pulse constant	0	1-65535	R/W
10b7H	Working mode of DO3,4	0	0-pulse output 1-alarming output	R/W
10b8H	DO Pulse width	20	20-1000ms	R/W
10b9H	DO3 output	0	0-none 1-consumption power 2-gererating power 3-absorption reactive power 4-generating reactive power	R/W
10baH	DO4 output	0	Same as above	R/W
10bbH	AO3,4 type	0	0:0-20mA, 1:4-20mA, 2:0-5V, 3:1-5V	R/W

AXM-IO32

Address	Parameter	Default	Range	Property
10bcH	DI25-28 type	0	Bit0-DI25, Bit1-DI26 Bit2-DI27, Bit3-DI28 0-DI, 1-pulse counter	R/W
10bdH	DI pulse constant	0	1-65535	R/W
10beH	Working mode of relay 7 and 8	0	0-control output 1-alarming output	R/W
10bfH	Output mode of relay 7 and 8	0	0-latch, 1-momentary	R/W
10c0H	Pulse width	50	50-3000	R/W
10c1H	AI3,4 type	0	0:0-20mA, 1:4-20mA, 2:0-5V, 3:1-5V	R/W

AO transforming select

Address	Parameter	Default	Range	
10c2H	AO1 transforming parameter		Refer to following table	R/W
10c3H	AO2 transforming parameter		Refer to following table	R/W
10c4H	AO3 transforming parameter		Refer to following table	R/W
10c5H	AO4 transforming parameter		Refer to following table	R/W

AO transforming parameter settings

Setting value	Ttransforming object	Setting value	Transforming object	Setting value	Transforming object
0	Frequency	1	Va	2	Vb
3	Vc	4	Average phase voltage	5	Uab
6	Ubc	7	Uca	8	Average line voltage
9	Line current of phase A	10	Line current of phase B	11	Line current of phase C
12	Average line current	13	Neutral current	14	Power of phase A
15	Power of phase B	16	Power of phase C	17	Power of all
18	Reactive power of phase A	19	Reactive power of phase B	20	Reactive power of phase C
21	Reactive power of all	22	Apparent power of phase A	23	Apparent power of phase B
24	Apparent power of phase C	25	Apparent power of all	26	PF of A
27	PF of B	28	PF of C	29	PF

Basic Analog measurements

There are two different modes to read basic analog measurements, one is secondary mode, and another is primary mode. In primary mode, the numerical value in register of Acuvim II is equal to the real physical

value. In secondary mode, the relationship between numerical value in register and the real physical value is as following table. (Rx is the numerical value in register of Acuvim II)

Function code: 03H for reading.

Address	Parameter	Code	Relationship	
4000H~4001H	Frequency	F1	F = Rx	R
4002H~4003H	Phase voltage V1	F1	U=Rx×(PT1/PT2)	R
4004H~4005H	Phase voltage V2	F1	U=Rx×(PT1/PT2)	R
4006H~4007H	Phase voltage V3	F1	U=Rx×(PT1/PT2)	R
4008H~4009H	Average voltage Vavg	F1	U=Rx×(PT1/PT2)	R
400aH~400bH	Line voltage V12	F1	U=Rx×(PT1/PT2)	R
400cH~400dH	Line voltage V23	F1	U=Rx×(PT1/PT2)	R
400eH~400fH	Line voltage V31	F1	U=Rx×(PT1/PT2)	R
4010H~4011H	Average line voltage Vlavg	F1	U=Rx×(PT1/PT2)	R
4012H~4013H	Phase(line)current I1	F1	I=Rx×(CT1/CT2)	R
4014H~4015H	Phase(line)current I2	F1	I=Rx×(CT1/CT2)	R
4016H~4017H	Phase(line)current I3	F1	I=Rx×(CT1/CT2)	R
4018H~4019H	Average current Iavg	F1	I=Rx×(CT1/CT2)	R
401aH~401bH	Neutral current In	F1	I=Rx×(CT1/CT2)	R
401cH~401dH	Phase A power Pa	F1	P=Rx×(PT1/PT2)×(CT1/CT2)	R
401eH~401fH	Phase B power Pb	F1	P=Rx×(PT1/PT2)×(CT1/CT2)	R
4020H~4021H	Phase C power Pc	F1	P=Rx×(PT1/PT2)×(CT1/CT2)	R
4022H~4023H	System power Psum	F1	P=Rx×(PT1/PT2)×(CT1/CT2)	R
4024H~4025H	Phase A reactive power Qa	F1	Q=Rx×(PT1/PT2)×(CT1/CT2)	R
4025H~4027H	Phase B reactive power Qb	F1	Q=Rx×(PT1/PT2)×(CT1/CT2)	R
4028H~4029H	Phase C reactive power Qc	F1	Q=Rx×(PT1/PT2)×(CT1/CT2)	R

402aH-402bH	System reactive power Qsum	F1	Q=Rx×(PT1/PT2)×(CT1/CT2)	R
402cH-402dH	Phase A Apparent power Sa	F1	S=Rx×(PT1/PT2)×(CT1/CT2)	R
402eH-402fH	Phase B Apparent power Sb	F1	S=Rx×(PT1/PT2)×(CT1/CT2)	R
4030H-4031H	Phase C Apparent power Sc	F1	S=Rx×(PT1/PT2)×(CT1/CT2)	R
4032H-4033H	System Apparent power Ssum	F1	S=Rx×(PT1/PT2)×(CT1/CT2)	R
4034H-4035H	Phase A power factor PFa	F1	PF = Rx	R
4036H-4037H	Phase B power factor PFb	F1	PF = Rx	R
4038H-4039H	Phase C power factor PFc	F1	PF = Rx	R
403aH-403bH	System power factor PFsum	F1	PF = Rx	R
403cH-403dH	Voltage unbalance factor U_unbl	F1	Unbalance = Rx × 100%	R
403eH-403fH	Current unbalance factor I_unbl	F1	Unbalance = Rx × 100%	R
4040H-4041H	Load characteristic(L/C/R)	F1	76.0/67.0/82.0(ASCII)	R
4042H-4043H	Power demand	F1	P=Rx×(PT1/PT2)×(CT1/CT2)	R
4044H-4045H	Reactive Power demand	F1	P=Rx×(PT1/PT2)×(CT1/CT2)	R
4046H-4047H	Apparent power demand	F1	P=Rx×(PT1/PT2)×(CT1/CT2)	R

Real time energy measurement

Data stored in this block can be preset or cleared.
Function code: 03H for reading, 10H for writing. Data type: dword.

It can be set as primary energy or secondary energy according to user. Please refer to F7, F8, and F9 for more details about the relationship between numerical value in register and the real physical value.

Address	Parameter	Code	Range	Property
4048H-4049H	Energy IMP	F4/F7	0-999999999	R/W
404aH-404bH	Energy EXP	F4/F7	0-999999999	R/W
404cH-404dH	Reactive energy IMP	F5/F8	0-999999999	R/W
404eH-404fH	Reactive energy EXP	F5/F8	0-999999999	R/W
4050H-4051H	Energy TOTAL	F4/F7	0-999999999	R/W
4052H-4053H	Energy NET	F4/F7	0-999999999	R/W
4054H-4055H	Reactive energy TOTAL	F5/F8	0-999999999	R/W
4056H-4057H	Reactive energy NET	F5/F8	0-999999999	R/W
4058H-4059H	Apparent energy	F6/F9	0-999999999	R/W

Harmonics:

THD, Harmonics, odd HD, even HD, Crest Factor, THFF, K factor etc are all stored here. The data type is “word”. Voltage parameters refer to line voltage when it is set to “2LL/3LL” and phase voltage for others. Function code: 03H for reading.

Address	Parameter	code	Range	Property
The following are the THD of voltage and current				
405aH	THD_V1 of V1(V12)	F18	0~10000	R
405bH	THD_V1 of V2(V31)	F18	0~10000	R
405cH	THD_V1 of V3(V23)	F18	0~10000	R
405dH	Average THD_V	F18	0~10000	R
405eH	THD_I1	F18	0~10000	R
405fH	THD_I2	F18	0~10000	R
4060H	THD_I3	F18	0~10000	R
4061H	Average THD_I	F18	0~10000	R

Voltage Harmonics, even HD, odd HD, Crest Factor are shown as below				
4062H-407fH	Harmonics of V1(V12) (the 2nd to 31st)	F19	0~10000	R
4080H	Odd HD of V1(V12)	F20	0~10000	R
4081H	Even HD of V1(V12)	F21	0~10000	R
4082H	Crest Factor of V1(V12)	F22	0~65535	R
4083H	THFF of V1(V12)	F24	0~10000	R
4084H-40a5H	Parameters of V2(V31)	Same as V1		R
40a6H-40c7H	Parameters of V3(V23)	Same as V1		R
40c8H-40e5H	Harmonics of I1 (the 2nd to 31st)	F19	0~10000	R
40e6H	Odd HD of I1	F20	0~10000	R
40e7H	Even HD of I1	F21	0~10000	R
40e8H	K Factor of I1	F23	0~65535	R
40e9H-4109H	Parameters of I2	Same as I1		R
410aH-412aH	Parameters of I3	Same as I1		R

MAX/MIN records

MAX/MIN value and stamp time. Function code: 03H for reading.

Address	Parameter	Code	Range	Property
4136H	MAX of V1	F11	-32768~32767	R
4137H-413cH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
413dH	MAX of V2	F11	-32768~32767	R
413eH-4143H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4144H	MAX of V3	F11	-32768~32767	R

4145H-414aH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
414bH	MAX of V12	F11	-32768~32767	R
414cH-4151H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4152H	MAX of V23	F11	-32768~32767	R
4153H-4158H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4159H	MAX of V31	F11	-32768~32767	R
415aH-415fH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4160H	MAX of I1	F12	-32768~32767	R
4161H-4166H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4167H	MAX of I2	F12	-32768~32767	R
4168H-416dH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
416eH	MAX of I3	F12	-32768~32767	R
416fH-4174H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4175H	MAX of system power	F13	-32768~32767	R
4176H-417bH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
417cH	MAX of system reactive power	F14	-32768~32767	R
417dH-4182H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4183H	MAX of system apparent power	F15	-32768~32767	R
4184H-4189H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
418aH	MAX of power factor	F16	-32768~32767	R
418bH-4190H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4191H	MAX of frequency	F10	-32768~32767	R

4192H-4197H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
4198H	MAX of power demand	F13	-32768~32767	R
4199H-419eH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
419fH	MAX of reactive power demand	F14	-32768~32767	R
41a0H-41a5H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41a6H	MAX of apparent power demand	F15	-32768~32767	R
41a7H-41acH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41adH	MAX of voltage unbalance factor	F17	-32768~32767	R
41aeH-41b3H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41b4H	MAX of current unbalance factor	F17	-32768~32767	R
41b5H-41baH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41bbH	MAX of V1(V12) THD	F18	-32768~32767	R
41bcH-41c1H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41c2H	MAX of V2(V31) THD	F18	-32768~32767	R
41c3H-41c8H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41c9H	MAX of V3(V23) THD	F18	-32768~32767	R
41caH-41cfH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41d0H	MAX of I1 THD	F18	-32768~32767	R
41d1H-41d6H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41d7H	MAX of I2 THD	F18	-32768~32767	R
41d8H-41ddH	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41deH	MAX of I3 THD	F18	-32768~32767	R

41dfH-41e4H	Time stamp: yyyy:mm:dd:hh:mm:ss	F3	time	R
41e5H~4293H are the address of previous parameters' MIN having the same format				

Sequence component

U1 (U12), I1 are consisting of real part and complex part. They have positive sequence, negative sequence and zero sequence. Data type is "int". Function code: 03H for reading.

Address	Parameter	code	Range	property
4294H	positive sequence real part of UA	F11	-32768~32767	R
4295H	positive sequence complex part of UA	F11	-32768~32767	R
4296H	negative sequence real part of UA	F11	-32768~32767	R
4297H	negative sequence complex part of UA	F11	-32768~32767	R
4298H	zero sequence real part of UA	F11	-32768~32767	R
4299H	zero sequence complex part of UA	F11	-32768~32767	R
429aH	positive sequence real part of IA	F12	-32768~32767	R
429bH	positive sequence complex part of IA	F12	-32768~32767	R
429cH	negative sequence real part of IA	F12	-32768~32767	R
429dH	negative sequence complex part of IA	F12	-32768~32767	R
429eH	zero sequence real part of IA	F12	-32768~32767	R
429fH	zero sequence complex part of IA	F12	-32768~32767	R

Phase angle

All voltage and current's phase angles corresponding to V1 (V12) are stored here. You can find out the phase sequence according to them. Data type is "word". Function code: 03H for reading.

Address	Parameter	code	Range	property
42a0H	phase angle of V2 to V1	F25	0-3600	R
42a1H	phase angle of V3 to V1	F25	0-3600	R
42a2H	phase angle of I1 to V1	F25	0-3600	R
42a3H	phase angle of I2 to V1	F25	0-3600	R

42a4H	phase angle of I3 to V1	F25	0-3600	R
42a5H	phase angle of V23 to V12	F25	0-3600	R
42a6H	phase angle of I1 to V12	F25	0-3600	R
42a7H	phase angle of I2 to V12	F25	0-3600	R
42a8H	phase angle of I3 to V12	F25	0-3600	R

Alarming records

There are 16 groups of records with the same format. Function code: 03H for reading, 10H for writing. Please refer to chapter 4 for more details.

Address	Parameter	code	Range	property
42a9H	First group: alarming status	F1	0~65535	R
42aaH	First group: alarming parameter code	F1	0~44	R
42abH	First group: over range or reset value	F10-F18	Related with parameters	R
42acH~42b2H	First group: Time stamp: yyyy:mm:dd:hh:mm:ss:ms	F3		R
42b3H~42bcH	Second group	Same as the first group		
42bdH~42c6H	Third group	Same as the first group		
42c7H~42d0H	Fourth group	Same as the first group		
42d1H~42daH	Fifth group	Same as the first group		
42dbH~42e4H	Sixth group	Same as the first group		
42e5H~42eeH	Seventh group	Same as the first group		
42efH~42f8H	Eighth group	Same as the first group		
42f9H~4302H	Ninth group	Same as the first group		
4303H~430cH	Tenth group	Same as the first group		
430dH~4316H	Eleventh group	Same as the first group		
4317H~4320H	Twelfth group	Same as the first group		
4321H~432aH	Thirteenth group	Same as the first group		
432bH~4334H	Fourteenth group	Same as the first group		

4335H~433eH	Fifteenth group	Same as the first group
433fH~4348H	Sixteenth group	Same as the first group

Counting number of I/O Modules

DI are arranged according to expanded I/O module addresses, user can check out the counting number of DI along with those modules. The counting number of I/O modules will be stored in non-volatile memory during power off. They can be cleared up via communication and panel. Data type is "word". Function code: 03H for reading.

Address	Parameter	code	Range	property
AXM-IO11				
4349H-434aH	DI1 pulse counter number	F1	0-4294967295	R
434bH-434cH	DI2 pulse counter number	F1	0-4294967295	R
434dH-434eH	DI3 pulse counter number	F1	0-4294967295	R
434fH-4350H	DI4 pulse counter number	F1	0-4294967295	R
4351H-4352H	DI5 pulse counter number	F1	0-4294967295	R
4353H-4354H	DI6 pulse counter number	F1	0-4294967295	R
AXM-IO21				
4355H-4356H	DI7 pulse counter number	F1	0-4294967295	R
4357H-4358H	DI8 pulse counter number	F1	0-4294967295	R
4359H-435aH	DI9 pulse counter number	F1	0-4294967295	R
435bH-435cH	DI10 pulse counter number	F1	0-4294967295	R
AXM-IO31				
435dH-435eH	DI11 pulse counter number	F1	0-4294967295	R
435fH-4360H	DI12 pulse counter number	F1	0-4294967295	R
4361H-4362H	DI13 pulse counter number	F1	0-4294967295	R
4363H-4364H	DI14 pulse counter number	F1	0-4294967295	R
AXM-IO12				
4365H-4366H	DI15 pulse counter number	F1	0-4294967295	R
4367H-4368H	DI16 pulse counter number	F1	0-4294967295	R
4369H-436aH	DI17 pulse counter number	F1	0-4294967295	R

436bH-436cH	DI18 pulse counter number	F1	0-4294967295	R
436dH-436eH	DI19 pulse counter number	F1	0-4294967295	R
436fH-4370H	DI20 pulse counter number	F1	0-4294967295	R
AXM-IO22				
4371H-4372H	DI21 pulse counter number	F1	0-4294967295	R
4373H-4374H	DI22 pulse counter number	F1	0-4294967295	R
4375H-4376H	DI23 pulse counter number	F1	0-4294967295	R
4377H-4378H	DI24 pulse counter number	F1	0-4294967295	R
AXM-IO32				
4379H-437aH	DI25 pulse counter number	F1	0-4294967295	R
437bH-437cH	DI26 pulse counter number	F1	0-4294967295	R
437dH-437eH	DI27 pulse counter number	F1	0-4294967295	R
437fH-4380H	DI28 pulse counter number	F1	0-4294967295	R

AI input value

The output of AI is mapped to the range of 0~4095 according to its sampling value using some algorithm. Data type is "word". Function code: 03H for reading. Please refer to <<User's manual of expanded I/O modules>> for more details.

Address	Parameter	code	Range	property
4385H	AI1 sampling value	F1	0-4095	R
4386H	AI2 sampling value	F1	0-4095	R
4387H	AI3 sampling value	F1	0-4095	R
4388H	AI4 sampling value	F1	0-4095	R

AO output

The output of AO is the actual value of output. It will get a different unit (V or mA) according to different outputs. Data type is "float". Function code: 03H for reading. Please refer to <<User's manual of expanded I/O modules>> for more details.

Address	Parameter	code	Range	property
438aH-438bH	Value of A01	F1		R
438cH-438dH	Value of A02	F1		R
438eH-438fH	Value of A03	F1		R
4390H-4391H	Value of A04	F1		R

SOE Records

There are 20 groups of records with the same format. Function code: 03H for reading. What you need to know is that the data is got from the SOE enabled I/O module, if this I/O module is not connected, the data is useless. Please refer to <<User's manual of expanded I/O modules>> for more details.

Address	Parameter	code	Range	property
4399H~439fH	First group: time stamp: yyyy:mm:dd:hh:mm:ss:ms	F3		R
43a0H	First group: DI status	F1		R
43a1H-4438H	2nd to 20th group			R
4439H	I/O module of SOE	F1	0:none; 1:AXM-IO11; 2:AXM-IO21; 3:AXM-IO31; 4:AXM-IO12; 5:AXM-IO22; 6:AXM-IO32	R

DI Status

Current DI status, if related I/O module isn't connected, the DI status will be set to 0. Function code: 02H for reading.

Address	Parameter	Range	Data type
AXM-IO11			
0000H	DI1	1=ON,0=OFF	bit
0001H	DI2	1=ON,0=OFF	bit
0002H	DI3	1=ON,0=OFF	bit
0003H	DI4	1=ON,0=OFF	bit
0004H	DI5	1=ON,0=OFF	bit
0005H	DI6	1=ON,0=OFF	bit
AXM-IO21			
0006H	DI7	1=ON,0=OFF	bit
0007H	DI8	1=ON,0=OFF	bit
0008H	DI9	1=ON,0=OFF	bit
0009H	DI10	1=ON,0=OFF	bit
AXM-IO31			
000aH	DI11	1=ON,0=OFF	bit
000bH	DI12	1=ON,0=OFF	bit
000cH	DI13	1=ON,0=OFF	bit
000dH	DI14	1=ON,0=OFF	bit
AXM-IO12			
000eH	DI15	1=ON,0=OFF	bit
000fH	DI16	1=ON,0=OFF	bit
0010H	DI17	1=ON,0=OFF	bit
0011H	DI18	1=ON,0=OFF	bit
0012H	DI19	1=ON,0=OFF	bit
0013H	DI20	1=ON,0=OFF	bit
AXM-IO22			
0014H	DI21	1=ON,0=OFF	bit
0015H	DI22	1=ON,0=OFF	bit
0016H	DI23	1=ON,0=OFF	bit
0017H	DI24	1=ON,0=OFF	bit
AXM-IO32			
0018H	DI25	1=ON,0=OFF	bit

0019H	DI26	1=ON,0=OFF	bit
001aH	DI27	1=ON,0=OFF	bit
001bH	DI28	1=ON,0=OFF	bit

Relay status

Function code: 01H for reading, 05H for controlling output.

Address	Parameter	Range	Data type
AXM-IO11			
0000H	Relay1	1=ON,0=OFF	bit
0001H	Relay2	1=ON,0=OFF	bit
AXM-IO31			
0002H	Relay3	1=ON,0=OFF	bit
0003H	Relay4	1=ON,0=OFF	bit
AXM-IO12			
0004H	Relay5	1=ON,0=OFF	bit
0005H	Relay6	1=ON,0=OFF	bit
AXM-IO32			
0006H	Relay7	1=ON,0=OFF	bit
0007H	Relay8	1=ON,0=OFF	bit

Appendix

Appendix A Technical Data and Specifications

Appendix B Ordering Information

Appendix C Revision History

Appendix A Technical data and Specification

Input ratings

Voltage input	
Voltage rating	400 LN / 690 LL Vac RMS (3-phase), 400 LN Vac RMS（single-phase） With 20% overage (3LN or 2LN wiring) Installation Category III, Pollution Degree 2
Frequency range	45~65Hz
overload	2 times(continuously); 2500Vac per second (no recurrence)
Voltage range through PT	1000KV highest at primary side
PT burden	<0.2VA
Measuring	True-Rms

Current input	
Current rating	5Amp AC (1Amp AC Optional)
Metering range	0~10Amp AC
Current range	50000A highest at primary side
Overload	10A (continuously）; 100A per sec(no recurrence)
CT burden	<0.5VA
Measuring	True-Rms

Accuracy

Parameter	Accuracy
Voltage1	0.2%
Current2	0.2%
Power	0.5%
Reactive Power	0.5%
Apparent Power	0.5%
Power Factor	0.5%
Frequency	0.2%
Energy	0.5%
Reactive Energy	0.5%
THD	1.0%
Unbalance Factor	0.5%
Drift with Temperature	Less than 100ppm/℃
Stability	0.5‰/year

Standards	
Measuring	IEC 60253-22 0.5S IEC 60253-23
Environmental	IEC 60068-2
Safety	IEC 61010-1, UL61010-1
EMC	IEC 61000-4/2-3-4-5-6-8-11
Dimension	DIN43700/ANSI C39.1

Communication Port	
Type	RS485, Half Duplex, Optical Isolated
Protocol	Modbus RTU
Baud Rate	1200~38400bps

Suitable Conditions	
Dimensions (mm)	96x96x51 (Cut-out 92x92 or 4-inch Round)
Protection Level	IP52 (Front), IP30 (Cover)
Weight (g)	350g
Temperature	-25℃~70℃, Metering -40℃~85℃, Storage
Humidity	5%~95% Non-condensing
Power Supply	100~415Vac, 50/60Hz; 100~300Vdc Category III, Pollution degree 2
Power Consumption	5W

Appendix B Ordering Information

Acuvim II

Note: 1. 5A of the current input is the standard product. Please contact factory if 1A current needed.

2. The range of power supply:
   100~415Vac, 50/60Hz
   100~300Vdc
   Please contact factory if low DC voltage power supply needed.

Appendix C Revision History

Revision	Date	Description
1.0	20070915	
1.1	20070930	P47: change the flow chart; P86: change value of address 101dH from "Reserved" to "Basic parameter mode"; P93: change the description of "Basic analog measurement"; P101~P102: change the description "Counting number of I/O modules".
1.2	20071016	P50: change the flow chart; add the function: AO transforming parameters setting via the front panel.

Your Power and Automation Partner

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